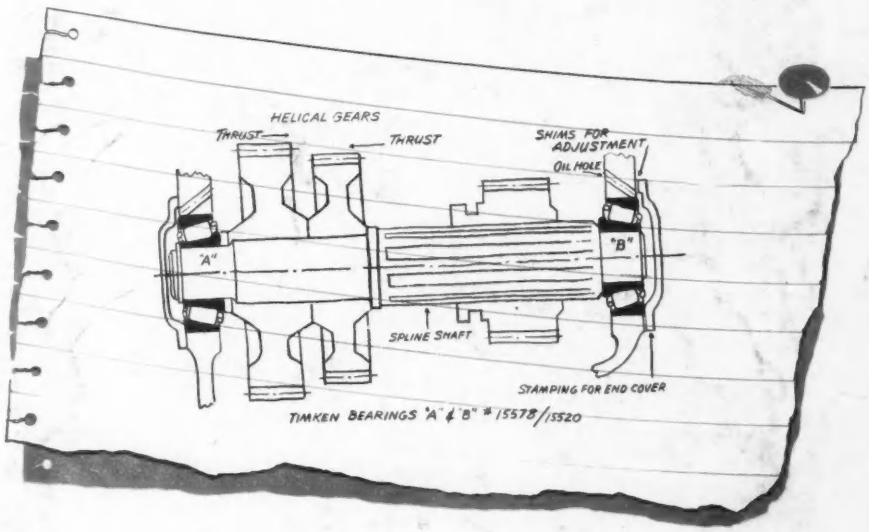
AUTOMOTIVE and Aviation INDUSTRIES

APRIL 15, 1947

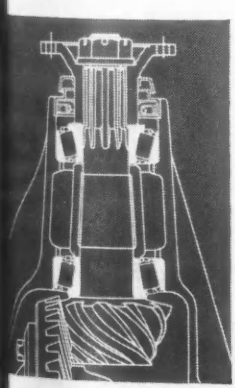
How about life insurance" for our new automatic transmission?



N easy, inexpensive way to insure long, trouble-free life for your new automatic transmission is to plan now use Timken tapered roller bearings.

Timken bearings hold gears and shafts in rigid alignnt, eliminating deflections and end movement. Because their greater load carrying capacity and longer life, the ft *stays* put too. Smooth meshing is insured, wear held a minimum, gear life prolonged!

The problem of thrust loads—an important factor with ical gears—is solved at the same time, because Timken bearings take loads from any direction without flinching. The need for special thrust bearings or washers is eliminated, designs can be simplified.



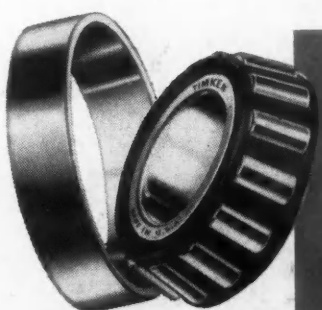
LOOK AT PINIONS FOR EXAMPLE .... Timken bearing-equipped pinions and ring gears usually outlast the rest of the power train. And in wheels, differentials and steering parts, too, Timken tapered roller bearings have wed their outstanding ability to take the tough loads in any nbination on cars, trucks, busses and farm implements.

There are good reasons for this! Fine alloy steel from our own mill. Precision manufacture. Quality control from start to finish. Leadership in research and design.

The Timken Company has worked hand in hand with auto designers for nearly half a century. Our engineering facilities are at your disposal today. If you're designing an automatic transmission—CALL IN TIMKEN* . . . NOW! In Detroit, phone MAdison 1380.

The Timken Roller Bearing Company, Canton 6, Ohio.

NOTE TO P.A.'S: *Because every step of the manufacture of Timken bearings is controlled within our company . . . because our vast manufacturing facilities are widely dispersed . . . you will find the Timken Company a supply source of outstanding reliability.*



TIMKEN

*TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳

This Assembly Undergoes

19

FINISHING OPERATIONS

at once!

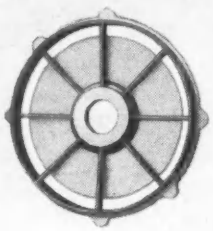
Its mating parts fit together perfectly after one complete Bore-Matic cycle

HERE'S HOW a vacuum cleaner manufacturer achieves the balanced production of assembly units needed to speed his output and cut operating costs. He uses a single Heald No. 49 Double End Bore-Matic to finish mating parts at 3 separate stations, in *one* automatic cycle. Altogether, this machine performs 19 various finishing operations, including boring, plunge facing, chamfering and turning—each to extremely close tolerances.

Intricate tooling setups like this one, worked out by experienced Heald engineers, can mean valuable indirect savings as well as greater production in your own work. For they produce uniformly accurate results which reduce scrap to a minimum, assure a fine finish, and speed final assembly. All finished parts match perfectly, providing a balanced output of parts and eliminating the need for costly hand fitting and selective assembly.

If you manufacture mating parts, or any other high precision product, let Heald engineers show you where the most accurate production methods are often the fastest and most economical. Get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

STATIONS 1 and 2

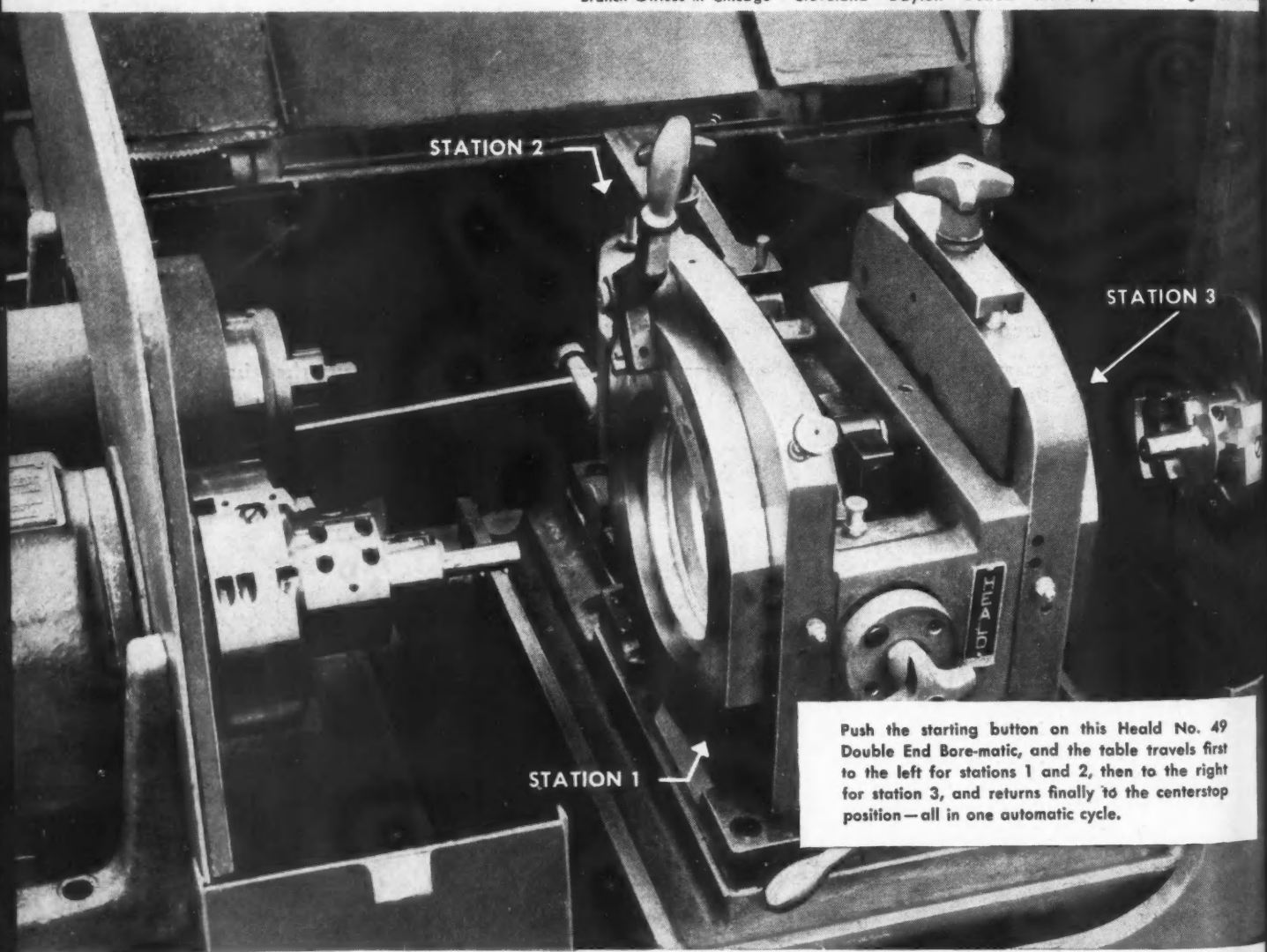


STATION 3

HEALD

means more precision . . . less cost

Branch Offices in Chicago · Cleveland · Dayton · Detroit · Indianapolis · Lansing · New Yor



Push the starting button on this Heald No. 49 Double End Bore-matic, and the table travels first to the left for stations 1 and 2, then to the right for station 3, and returns finally to the centerstop position—all in one automatic cycle.

INTERNAL AND SURFACE GRINDING MACHINES · BORE-MATIC PRECISION FINISHING MACHINES

AUTOMOTIVE and Aviation INDUSTRIES

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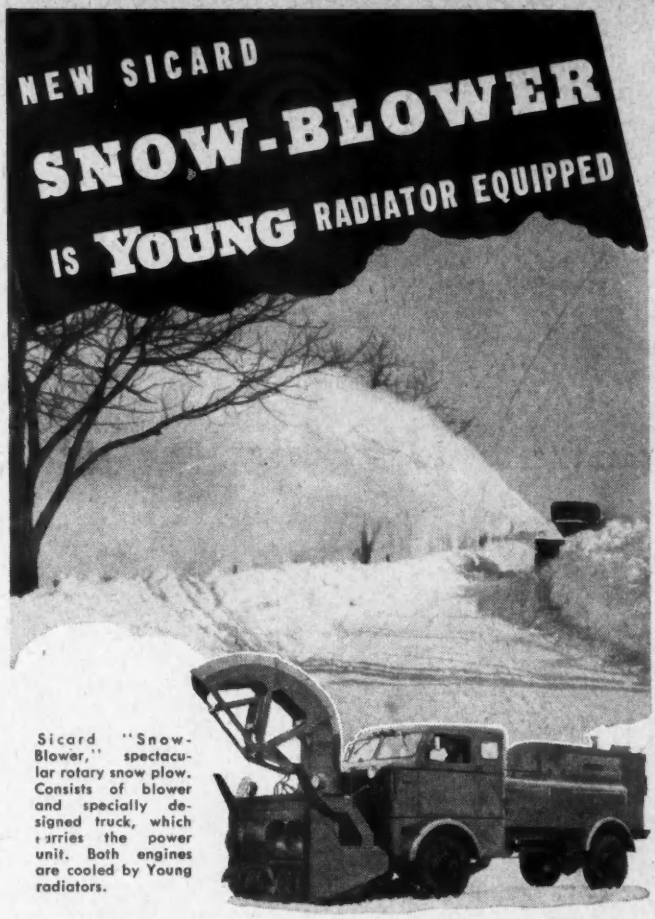

Sicard "Snow-Blower," spectacular rotary snow plow. Consists of blower and specially designed truck, which carries the power unit. Both engines are cooled by Young radiators.

If you've ever bent your back over a few inches of snow on the sidewalk, you know that snow-removal is "hot" work. It's easy to imagine the tremendous power necessary to scoop up huge drifts of snow and blow them as far as 150 feet. Such effort puts an extreme load on both truck and power unit. This unique machine, developed by Sicard, Limited, of Montreal, Quebec, employs two Young radiators: one to cool the truck engine—the other to regulate the jacket water temperature of the blower power unit.

Whether you have a routine or unusual heat transfer problem, refer it to Young's Engineering Staff. They have a knack of coming up with the right answer time after time. Your inquiry places you under no obligation.

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OIL COOLERS • GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS • HEAT EXCHANGERS
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AND A COMPLETE LINE OF AIRCRAFT HEAT TRANSFER EQUIPMENT
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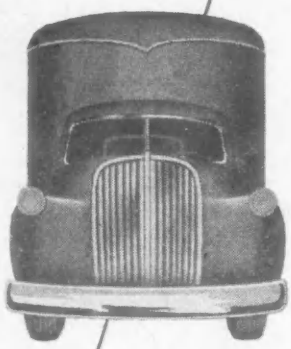
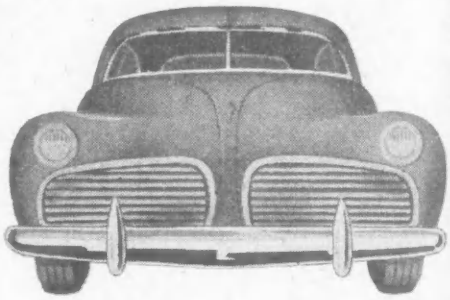
Automotive Vehicles

Ever Built



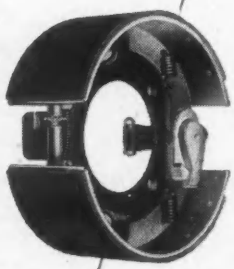
have been

Better Because of



Bendix Cooperation

The Bendix Parking and Emergency Brake is the product of close cooperation between Bendix and a prominent bus manufacturer. Designed for driveshaft installation, this brake was tailor-made to a specific job, proven in use, and then made available to the industry at large. Thus the entire industry benefits from the work Bendix does for individual manufacturers.



The entire automotive industry has been built on the cooperation of thousands of skilled hands, hundreds of skilled companies. The engineering and production miracles that have become the commonplace would be impossible without this coordinated effort. In Bendix' long history of partnership with the industry, cooperation is more than an adjunct to production—it is the basic Bendix* method of operation. The Bendix products that find such wide acceptance *always* trace their beginnings to developmental cooperation with the manufacturer.

*REG. U.S. PAT. OFF.

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SOUTH BEND 20, IND.

Bendix
AVIATION CORPORATION

CENTERMOUNT PARKING BRAKE
WHEEL BRAKES
HYDRAULIC REMOTE CONTROLS
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AUTOMOTIVE and AVIATION INDUSTRIES

Published on the first and 15th of the month

April 15, 1947
Volume 96, No. 8

Some High Spots of this Issue

Utilization of Exhaust Gas Energy for Engine Cooling

One of the newest exhaust ejector systems to be developed utilizes exhaust energy to cool an aircraft engine, to give added thrust to the power output, and to provide hot air for cabin heating and the de-icing of aerodynamic surfaces. The new device permits a cleaner arrangement of the radial engine installation, decreasing form drag and eliminating cooling drag. It is described and illustrated in an article beginning on page 24.

Roto-Shaving as Applied to Mass Production

New production methods at the New Process Gear Corp. include the employment of the Roto-Shaving process to increase productivity and reduce machining costs. Also described and illustrated is an improved gear quenching machine that provides a fully-automatic cycle. An article dealing with these modern facilities begins on page 28.

Advanced Methods in Building of Heavy Duty Trucks

Each vehicle is practically custom built to the requirements of the individual buyer at The Autocar Co. Except for the largest off-the-highway vehicles, Autocar makes such units as engines, rear axles, auxiliary transmissions and cabs in its own plants. Joseph Geschelin tells how this specialist in the manufacture of heavy duty trucks operates, beginning on page 30.

New Techniques for Evaluating Wearing Surfaces of Engines

Surface finishes of engine parts subject to wear may be evaluated by two newly-developed methods. Both methods use a plastic replica of the surface to be examined, but differ in their means of evaluation. One uses a photoelectric method, the other a microscope for examination of the replica. Both methods are described, beginning on page 36.

New Two-Stroke Engine Design

Here is described a small, two-stroke, single-cylinder engine equipped with a diaphragm pump, actuated by pulsations in the crankcase, and a floatless carburetor. An overflow pipe to the gasoline tank limits the fuel level in the carburetor. See page 35.

31 Items of New Products and New Production Equipment and Other High Spots Such As:

A Production Machine that Automatically Coats Cylinder Block Cores; New Crosswind Landing Gears of Caster Type; a New British Wheel Suspension Design.

Comprehensive Interpretation of Industry News, Page 17

For Complete Table of Contents See Page 3

AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Are You Using this Helpful Steel Guide?

Complete Stock List and Buying Data for Reference when You Call . . .

Complete information on Ryerson Steel—detailed listing of more than 10,000 kinds, shapes and sizes—ready for your steel buying convenience in the new Ryerson Stock List and Data Book. Also included are pages of time-saving informative data on Average Physical Properties, AISI and SAE Standard Steel Compositions and a wealth of other facts and figures. The book is cataloged to simplify the work of purchasing men, metallurgists, engineers—everyone who specifies, buys or works with steel.

All sizes listed are not always in stock, because of the great demand, but Ryerson continues to carry the country's largest stocks. With the Ryerson Stock List to guide you, one call, one order, one shipment, will often cover a varied group of steel needs.

Copies of the current 1947 edition have been widely distributed, but if you do not have one, contact the Ryerson plant nearest you. And be sure to check Ryerson for all steel requirements. If the exact steel you need is not in stock our experienced staff will be glad to suggest a practical alternate.

Joseph T. Ryerson & Son, Inc. Steel-Service Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles.

RYERSON STEEL

AUTOMOTIVE and Aviation INDUSTRIES

NEWS of the Industry

Car Makers' $ Volume May Set Record in '47

Latest official forecast of automotive production this year is that made by Karl M. Richards, manager of the Field Services Department of AMA. He said the industry will turn out 4.7 million vehicles this year—only 100,000 less than the 1941 production—and that sales of repair and replacement parts will be more than twice 1941 sales. He added that the dollar volume will exceed the previous record years of 1941 and 1929, provided, of course, that there are no major strikes in the automotive or supplying industries. Commenting on high production costs, Mr. Richards said that automobile industry payrolls are more than 70 per cent higher than in 1941.

Parts Makers Catching Up In Most Lines

Automotive parts manufacturers are rapidly reducing their back orders and in some lines actually are caught up at present. In fact, the situation now is such that there are signs of discount cutting on some of the more plentiful lines, indicating a highly competitive market is developing. With an improvement in the materials and labor situation, parts makers are able not only to supply their original equipment customers but are also catching up on slower moving lines which have been sacrificed in order to concentrate production on items in greater demand. Apparently the most serious bottleneck at present is in water pumps and items containing cast iron or sheet steel.

Steadily Climbing Material Costs Plague Car Makers

It is well known that material costs to automotive manufacturers have increased considerably month by month since the end of OPA. Consequently, there was a considerable flurry of interest when a report from Washington stated that the U. S. Steel Corp. was planning a price reduction on its products in the near future. There is no doubt that such a move would be extremely helpful, especially if it would generate a similar trend among other suppliers, but careful analysis reveals that even a cut of 10 per cent would make no appreciable cost reduction in the price of an automobile. It is estimated that a 10 per cent reduction would reduce cost of a passenger car approximately $10. Other components, such as copper and lead, on the other hand, have been going steadily upward and now appear to be leveling off at levels at least 50 per cent higher than last fall. Some industry spokesmen believe that there may be a chance for a reduction in the price of textiles since that field appears to be catching up to demand quite rapidly. One large mill in the south has reached the saturation point on clothing and has converted its entire facilities to the manufacture of automotive textiles. Copper apparently is one of the biggest worries so far as availability is concerned. The Government stockpile fell to 38,622 tons in March and is expected to be exhausted by the first of May. The copper industry reports that, even though the four cents a pound import duty is revoked, the world supply will not be equal to demand for at least the next two years.

Forecast of automotive production shows possible dollar volume record . . . Competition growing in automotive parts . . . Increasing material costs disturbing factor . . . Exports of automobiles are holding steady.

Henry Ford

1863 - 1947

Courageous, far-seeing pioneer — Giant of Industry — Genius of Production—Master craftsman in many fields — Humanitarian—A man whose life story is written in the minds of all people, whose life work benefited all mankind.

Born—Greenfield, Mich., July 30, 1863

Died — Dearborn, Mich., April 7, 1947

Car Export Rise Unlikely

Although all restrictions on exporting of new automobiles were lifted March 31, there is no indication that manufacturers will increase the number of cars sent abroad above the level prevailing under the Government regulation. The industry did not take advantage of its full allowable export quota during 1946 and manufacturers are reported to favor retaining most of the production for the domestic market as long as demand remains heavy. An interesting point is that the original order lifting export controls did not include new passenger cars, but was amended hurriedly to cover them. One report from Washington states that the export controls were lifted because the Office of International Trade lacked funds to administer them.

NEWS of the INDUSTRY

It Stacks Them

A possible answer to the onerous parking problem in big cities is this device being tried out by the Spokane Parking Association. Four cars can be parked on a ground area usually covered by one with this parking gadget. The lift at the left stacks the cars vertically in the steel rack tiers. International News photo

Chrysler Reduces Most Plymouth Prices

The Chrysler Corp. announced that prices on the Plymouth line have been reduced $25 to $55 per car on all Plymouth models except the convertible coupe and station wagon. The new low price brings the Plymouth back to its traditional position in relation to its nearest competitors—Chevrolet and Ford. The reduction is greater than the increase made last Nov. 26. The move is seen as evidence that present volume is sufficient to offset to some extent at least the sizeable increases in material costs since last fall. Another consideration is that with negotiations under way with the UAW-CIO on wage demands Chrysler can point out that it is doing its part to fight inflation, and that the union can contribute materially by modifying its wage demands.

PLYMOUTH DE LUXE	Old Price	New Price	Reduction
3-Pass. Coupe	$1,152.50	$1,117.50	$35
Club Coupe	1,226.25	1,171.25	55
2-Door Sedan	1,189.25	1,144.25	45
4-Door Sedan	1,231.50	1,196.50	35
PLYMOUTH SPECIAL DE LUXE			
3-Pass. Coupe	$1,225.50	$1,200.50	$25
Club Coupe	1,304.50	1,259.50	45
2-Door Sedan	1,267.75	1,232.75	35
4-Door Sedan	1,309.75	1,284.75	25

Tire Sales and Trade-ins Indicate Buyers' Market

There is plenty of evidence in Detroit that the sellers' market in tires has ended. Recently there have been concerted efforts by mail order houses and tire stores to promote tire sales at attractive prices. Not only are the tires offered in complete sets of four, but liberal trade-in allowances again are being offered. Another indication of the improved supply is the action by the Department of Commerce in lifting all export controls.

Ford Cuts One Model $20—Makes Styling Changes

Ford Motor Co. has cut $20 from the price of the Ford deluxe six cylinder, three-passenger business coupe which has been reinstated in the Ford line.

Running changes which incorporate exterior and interior styling changes, including 10 new colors, are being introduced in Ford passenger cars now being shipped to dealers. Exterior changes include relocation of parking lights, a new medallion in place of the hood ornament, and heavier bumper guards. The stainless steel belt trim is wider, door handles heavier, and the fender mouldings have been lowered and the rub moulding strips extended full length along the bottom of the front fenders. Restyling of the interior has made available two new custom upholstery combinations in the super deluxe line. Door panels have been completely restyled in heavier reddish brown artificial leather, and instruments have been enhanced by the addition of gold and gray screen textured dials.

Ford Coupe Recently Reinstated

This Ford deluxe six-cylinder, three-passenger business coupe has been recently reinstated in the Ford line and its price has been cut $20. As in other spring models this car reflects running changes

NEWS of the INDUSTRY

Hudson Raises Prices

The Hudson Motor Car Co. has raised its factory list prices from $25 on its three-passenger coupe to $69 on its four-door sedans; these raises supplement price increases of $60 to $90 made last November.

	Old Price	New Price	Increase
HUDSON SUPER SIX			
3-Pass. Coupe	$1,396.00	$1,421.00	$25
2-Door Sedan	1,425.00	1,493.00	68
Club Coupe	1,465.00	1,531.00	66
4-Door Sedan	1,467.00	1,536.00	69
HUDSON COMMODORE SIX			
Club Coupe	$1,601.00	$1,667.00	$66
4-Door Sedan	1,606.00	1,675.00	69
HUDSON SUPER EIGHT			
Club Coupe	$1,566.00	$1,632.00	$66
4-Door Sedan	1,569.00	1,638.00	69
HUDSON COMMODORE EIGHT			
Club Coupe	$1,660.00	$1,726.00	$66
4-Door Sedan	1,673.00	1,742.00	69

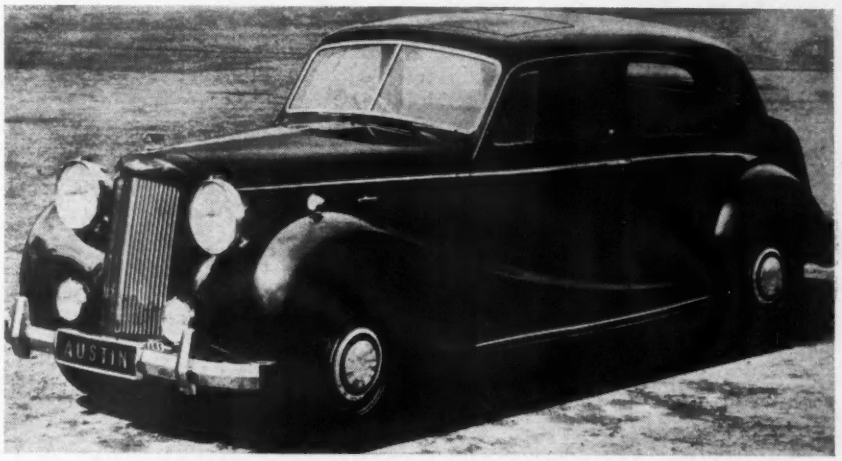
K-F Engine Output Up

Under its first month of Kaiser-Frazer operation, the K-F Detroit Engine Div. leased from Continental Motors, Inc., built 5294 automobile engines, which is 1162 more K-F engines than were produced in Detroit by Continental during February, according to Kaiser-Frazer Corp. A shortage of engines is said to have been a constant bottleneck to sustained production increase of Kaiser-Frazer.

Purification Studies Show Many Car Orders Not Valid

Despite optimistic forecasts of automobile order backlogs, there is still a considerable question in the minds of many observers about the actual extent of the present sellers' market. NADA, for example, has started a survey among its members to determine the extent of the present new car market. Many companies have been running purification studies on unfilled orders and it is generally conceded that the number listed on the books does not represent the number of cars that could be sold if immediately available. It is generally believed that at least 30 per cent of the orders are duplications or of no value for some other reason and in many cases the percentage is considerably higher. Kaiser-Frazer, for example, estimates that of the 960,000 orders on its books, about 250,000 are firm orders. The price cuts by Ford and Plymouth do not necessarily indicate any drying up of the market since these two lines, together with Chevrolet, are in the best position of any so far as sales are concerned. However, sales managers of all companies will tell you off the record that they seriously doubt the market is going to hold beyond this fall in its present lush state.

The New Austin Sheerline for Export



This new Austin Sheerline "110" sedan marks this British manufacturer's re-entry into the 6-cylinder market. It has a 117-in. wheelbase, develops 110 hp, has four built-in power operated hydraulic wheel jacks and is designed chiefly for export. The cost in England is approximately $5112, including purchase tax. British Combine photo

Tooling Costs May Effect Extent of Model Changes

Considerable interest has been focused lately on the extremely high cost of tooling for new models. Conservative estimates place the cost at two or three times the expenditure required in pre-war days. There are three principal factors to account for the increased cost: individual machines and tools cost more; labor cost is up very substantially; and with the present trend toward more machinery in relation to men, more equipment is needed than was formerly used. One aspect of the increased tooling cost that cannot be overlooked is the possibility that radical model changes may not come as frequently or be as extensive as was the case in pre-war years. When tooling costs become excessive, the amortization cost per car may become too burdensome to spread over one model run, with the result that in the future, dies and other equipment may be used over a much longer period of time. It is reported that automobile manufacturers are pointing out to tool and die shops that they should educate their workers regarding the inherent danger in excessive wage demands. They stress that if extremely high wage costs on tool and die work result in greatly reduced volume over two or three years, the workers stand to lose more than they can gain.

The Navy's Fastest

Designed for carrier operation, this North American Aviation FJ-1 all-jet fighter is shown streaking through the California blue at over 500 mph in the first flight picture of this Navy plane. The FJ-1 is now in production at North American Aviation's Los Angeles plant

NEWS of the INDUSTRY

K-F Extends Option On Willow Run

Kaiser-Frazer Corp. has signed an agreement with the Reconstruction Finance Corp. acting by and through the War Assets Administration under which the automobile company has the option to extend its present lease of the Willow Run plant for 18 years up to Dec. 31, 1965. The corporation also leased, at $200,000 a year, the Willow Run spare parts building now housing the experimental division, service training school and model service garage. Leasing of the additional building brings the government a total rent of $1,050,000 in 1947 and $1,400,000 in 1948 and thereafter.

No Restrictions on Tractor Exports

No licenses will be required to export tractors after April 7, 1947, the Office of International Trade, Department of Commerce announced. Because of a domestic shortage of both track-laying and wheeled tractors, they have been subject to export licensing control since August 8, 1946. Recently, however, production has expanded considerably, and indications point to a steadily increasing output.

White Sidewalls Back

With the exception of the ban on private importation of natural rubber and natural rubber latex which was removed recently, present rubber controls applying to allocation, consumption and inventories of rubber, specification for rubber production, and importation of designated rubber products will continue. However, for the first time since Pearl Harbor, white sidewall passenger car tires may be manufactured according to the Rubber Division, Civilian Production Administration.

With the lifting of government restrictions, the United States Rubber Co. announced recently that it would begin immediate production of white sidewall tires in all of its tire plants.

Indian Studebakers

Under the terms of a recent agreement with the Studebaker Corp., Hindustan Motors, Ltd., now has the exclusive rights for Studebaker car and truck assembly, manufacture and distribution in India, Burma, Ceylon, and Nepal. Initially, Hindustan will confine itself to assembling Studebakers at a new plant being constructed near Calcutta.

Aviation Corp. Now Avco Manufacturing Corp.

Stockholders of The Aviation Corp. recently have approved changing the name of the company to Avco Manufacturing Corp., and have elected five new directors to the board, including Harry Woodhead, president of Consolidated Vultee Aircraft Corp., an associated company. The change in name of the corporation results from a broad shift in character of its operations during recent years, it was pointed out. The company presently is a widely-diversified manufacturing corporation with more than three-fourths of its assets in fields other than aviation.

Amer. Locomotive Makes 75% Diesels in 1947

In planning to turn out three diesel-electric engines to every steam engine in 1947, the American Locomotive Co. expects to reverse its 1946 production proportion. In 1946 locomotive production was 75% steam and 25% diesel.

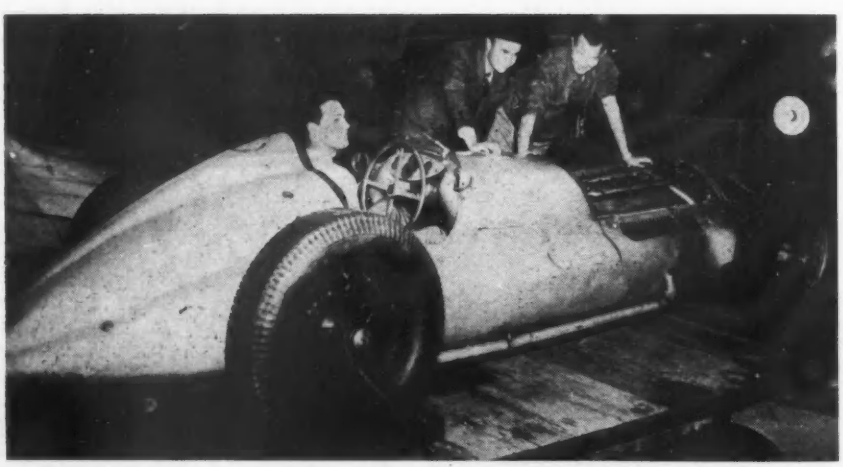
No Controls on Tire Exports

Export controls on new and used passenger car tires were removed on April 1, 1947. The decision to decontrol tires was based on the great improvement in domestic production, according to the Office of International Trade, Department of Commerce. Production of passenger tires was 28,392,000 in 1945, and increased to 66,508,000 in 1946, it was pointed out. Output in 1939 was 49,933,000. During 1945, OIT said, approximately one tire was available for domestic replacement for each car in service, while 1946 production provided two replacement tires for each car.

Chrysler Expands In Mexico

The large expansion program of the Chrysler assembly plant, Fabricas "Auto-Mex" at Mexico, D.F., the modern plant which assembles Plymouth, Dodge, De Soto and Chrysler automobiles and Dodge and Fargo trucks for distribution throughout Mexico was completed recently. The plant was started in 1938, and since the end of the war, a large expansion and modernization program has been carried out in which manufacturing area has been expanded 55 per cent. The main factory is 838 ft long and 243 ft wide and the modernization program included the lengthening of the frame production line by 147 ft, installation of a new painting system, a new conveyor system, and a new system of unloading materials from freight cars within the factory. Two train tracks have been built into the expanded factory so that five-car trains, each carrying all the units needed for 64 automobiles and trucks, can be unloaded at the proper places along the assembly line. The spe-

Hitler's Car to Race at Indianapolis



Reportedly built at Hitler's direction in 1938, this racing Mercedes-Benz is scheduled to be in the starting line-up of the 1947 Indianapolis 500-Mile Speedway Race on May 30. Scheduled for secret fuel tests and speed runs at Muroc, Calif., the 12-cylinder, 480 hp racer, purchased by Don Lee, Inc., recently arrived by plane in Los Angeles from Germany. Acme photo

NEWS of the INDUSTRY

Spring Model Lincoln

Several running changes have been included in both external and internal appointments of the new spring model Lincoln. A new chromium hood ornament superimposed on a brass sphere; restyling of hub caps; and the use of pull-out type door handles in place of the push-button type are among exterior changes. The new interior features new tailoring and colors covering instrument panels harmonized with new upholstery fabrics

cially adapted freight cars were improvised for the plant so that specific units for automobiles and trucks can be moved rapidly to the exact locations where they are needed.

What They Sell For In Australia

The following list of current Australian retail automobile prices for sedan models which include 10% sales tax based on wholesale prices has been supplied by a correspondent in that country. The current exchange rate for the Australian pound is 3.23:

Ford V-8	£668	Packard 8	£1330
Mercury	756	Packard 6	1276
Ford 10	467	Standard 8	550
Chevrolet Skymaster	661	Standard 14	720
Chevrolet Fleetmaster	682	Vauxhall Senior	609
Pontiac	796	Vauxhall Wyvern	540
Oldsmobile	836	Wolseley 18	1073
Buick	1011	Riley 12	1269
Plymouth	743		

Willys-Overland Gets $5 Million Stamping Shop

A five million dollar stamping shop, with a capacity of 15,000 tons of sheet steel monthly, will begin production within thirty days according to Willys-Overland Motors, Inc. The shop will be completed within a 90 day period, and 25 of a total of 53 presses up to 1400 ton capacity have already been installed.

Work on the project, which is part of the company's 21 million dollar expansion program was begun last July. The presses will be housed in a building with 135,000 sq ft of floor space. The largest press will be capable of producing complete stampings for a passenger car body, including the roof panel, fenders, hoods and other stampings required for Willys-Overland's new passenger car. In addition, the presses will be utilized for stampings for the company's jeep truck line soon to go into production.

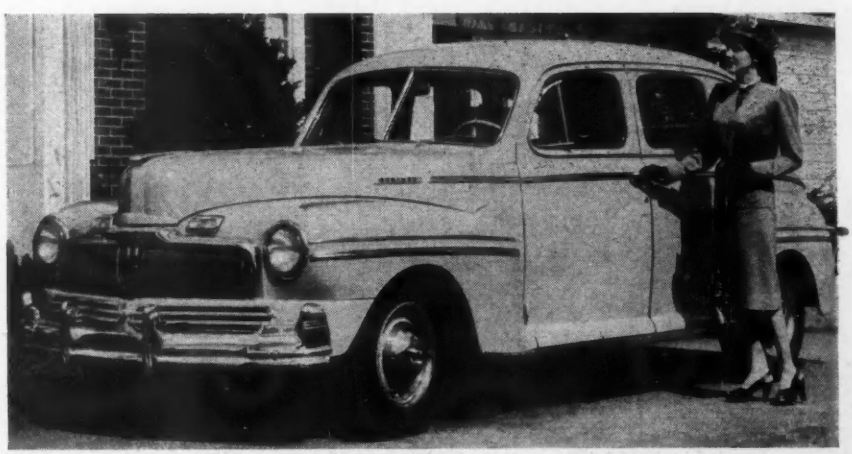
Perfect Circle Builds In Richmond, Ind.

The Perfect Circle Corp. plans to build a new plant at Richmond, Ind., to be located west of the present site of the former plant there which was a war plant and which has been sold by the government. Approximately 80,000 sq ft in area, the new plant will be completed by April 1, 1948.

Convair Closes Operations At Vultee Field Division

Consolidated Vultee Aircraft Corp. will discontinue operation of its Vultee Field div., Downey, Calif., around July 1 as a result of recent cancellation of the YP-81 contract and the poor outlook for obtaining replacement business. B-36 bomber components have been manufactured at the Vultee Field div. in recent months. This work will be returned to the Fort Worth div. where the giant bomber is in production for the Army Air Forces. The Downey plant has also been engaged in experimental programs for the Army and Navy, and these projects will be moved to the San Diego div.

Spring Model Mercury



Embodying several running changes including a new chrome grille frame, this new spring model Mercury has been restyled inside and out. Among the exterior changes are new hub caps, and new nameplates on rear deck, hood, and radiator grille. The interior trim has been restyled and the instrument panels have new dials

NEWS of the INDUSTRY

Ford Plans to Make More Electrical Parts

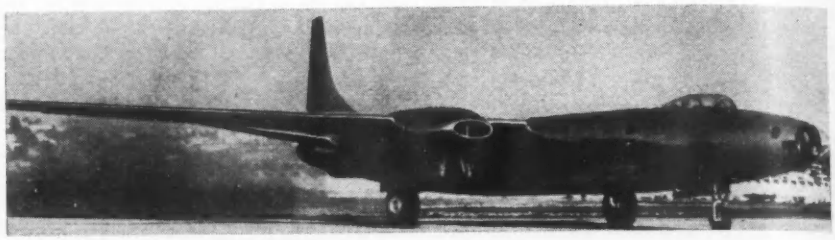
A one-story manufacturing unit and a two-story office building will be constructed at the Ypsilanti, Mich., plant of the Ford Motor Co. Additions will also be made to the present manufacturing structure. The new office building will house the administrative offices of Ford's small plant manufacturing activities.

The expansion program will provide facilities for the manufacture of all generators, starters, voltage regulators, and ignition coils for Ford, Mercury and Lincoln cars and Ford Tractors. Both current and service types will be produced at Ypsilanti. Full production in the enlarged plant is expected by the end of the year. The expansion is expected to double the production capacity of the present plant.

Awards to Ten by Helicopter Society

At the third annual meeting of the American Helicopter Society held in March at Philadelphia, awards were made to 10 persons for their outstanding work in the field of rotary wing aircraft. Harold F. Pitcairn, president of the Autogiro Corp. of America, was cited for his work in management, sponsorship and sales. J. P. Perry, chief engineer of the Firestone Aircraft Co. and Ralph Alex, Sikorsky Aircraft Div., United Aircraft Corp., were selected as outstanding in the field of engineering research and theory. Paul H. Stanley, chief engineer of the Autogiro Co., and Dr. J. A. J. Bennett, Fairey Aviation Co., England, were cited for their work in engineering design. D. B. Viner, Sikorsky Aircraft, was recognized for his contributions in test piloting. Adolph Plentafish, Sikorsky Aircraft; Edward Muller, Helicopter Air Transport; and Clifford Applegate were selected as award winners in the field of manufacturing and maintenance technique. In utilization and operation of helicopters, Lou Leavitt, Helicopter Air Transport, was chosen as the most outstanding contributor.

XB-46, AAF's Latest Jet Bomber



Powered by four GE J-35 jet engines arranged in pairs, two on either wing, with a single streamlined nacelle covering each pair, the Consolidated-Vultee experimental Army bomber, XB-46, is reported to have unofficially cruised at 450 mph in a recent test flight. The plane is 106 ft long, has a wing span of 113 ft, is 24 ft high and has a gross weight of 91,000 lb. International News photo

Production of Cars & Trucks*

(U. S. and Canada)

Week ending	1947	Corresponding Week in 1941
Jan. 4	53,437	78,690
11	64,828	115,935
18	75,166	124,025
25	93,278	121,948
Feb. 1	94,114	124,400
8	89,958	127,675
15	97,276	127,510
22	103,400	127,740
Mar. 1	105,175	126,550
8	104,048	125,915
15	105,496	131,410
22	108,472	123,805
29	100,355	124,165
Apr. 5	102,478	116,256
Total	1,297,481	1,694,023

* Compiled by Ward's Automotive Reports

New 1947½ Crosley Convertible

This two-door, four passenger convertible recently announced by Crosley as a new model in its 1947½ line is built on a 80-in. wheelbase chassis, and is powered by the Crosley Cobra engine which develops 26.5 hp. Identical with the 1947½ Crosley sedan in major details, except for the elimination of the roof panel, the top sides of the convertible body have wood rails into which are inserted removable bows for the canvas top which is held in place by snap-on fasteners

Complete Air Coverage At SAE Meeting in N. Y.

The SAE National Aeronautic Meeting, held April 9 to 11 in New York City, covered virtuallly everything in the aircraft field from jet powerplants for future helicopters to better seats for airline passengers, and included discussions on latest developments in engineering design and aircraft transport. The sessions were well attended with representatives from nearly every major aviation firm in the country, and the Army and Navy.

The SAE Wright Brothers Medal for 1946 was presented to Frederick V. H. Judd, powerplant technical engineer, Republic Aviation Corp., Farmingdale, L. I., N. Y., for his paper, "A Systematic Approach to the Aerodynamic Design of Radial Engine Installations," which was presented at the April, 1946, meeting.

Motor Vehicle Factory Sales from U. S. Plants*

	February 1947	January 1947	February 1946	Two Months 1947	Two Months 1946
Passenger Cars					
Domestic Market	244,411	225,989	54,111	470,400	107,552
Foreign Market	21,826	21,141	3,673	42,967	6,599
Total	266,237	247,130	57,784	513,367	114,151
Trucks					
Domestic Market	83,233	77,300	28,787	160,553	64,757
Foreign Market	23,086	23,792	8,206	46,878	15,269
Total	106,339	101,092	34,993	207,431	80,026
Buses					
Domestic Market	998	1,069	230	2,067	666
Foreign Market	213	171	35	384	66
Total	1,211	1,240	265	2,451	732
Total—All Vehicles	373,787	349,462	93,046	723,249	194,909

Truck Factory Sales by Gross Vehicle Weight*

G.V.W. in lbs.	February 1947	January 1947	February 1946	Two Months 1947	Two Months 1946
5,000 lbs. and less	30,097	29,973	13,758	60,070	32,293
5,001–10,000	14,777	12,383	3,100	27,160	6,977
10,001–14,000	28,829	29,156	9,436	57,985	18,494
14,001–16,000	21,697	20,948	4,624	45,645	13,123
16,001–19,500	2,863	3,773	1,230	6,636	2,876
19,501–26,000	3,072	2,807	1,760	5,879	3,896
Over 26,000	2,004	2,052	1,065	4,056	2,367
Total	106,339	101,092	34,993	207,431	80,026

*—Automobile Manufacturers Association.

New Truck Engine By Continental

Continental Motors Corp. has indicated that when volume production is established on its six cylinder 250 hp gasoline engine developed for installation in the IHC Model W-3042-H high speed truck, it will be offered to other truck manufacturers. The engine will then incorporate certain modifications for general use. Continental's subsidiary, Wisconsin Motor Corp., is scheduled to have a two cylinder engine ranging from 9 to 12.5 hp in production by next summer. Wisconsin in the past built only single cylinder and four cylinder models.

BHP in British Ads

Emulating American car advertising, current British advertisements for the Riley sedan in which engine size is given in terms of bhp may presage a new trend in British automobile advertising.

More Hydraulic Pumps By Pesco Products

Looking toward future manufacturing activity that will exceed its wartime peak, the Pesco Products Div. of Borg-Warner Corp. has embarked upon the line production of hydraulic pumps for industrial use. The company's expansion program has been spearheaded by the purchase of more than $300,000 in new semi-automatic equipment and almost complete rearrangement of the plant layout, marking a change-over from short run, job lot production to long term production.

LABOR

Nash Wage Settlement May Be Industry Pattern

First wage settlement among the automobile manufacturers was made by the Nash-Kelvinator Corp. recently when it granted a 10 cents an hour pay boost. The increase is renegotiable after a wage pattern is established in the automotive industry. However, in view of the 11½ cents an hour accepted by the rubber workers, it is believed in Detroit that the Nash increase will represent the pattern or will be very close to it. It is significant that none of the fringe demands, such as health and welfare funds and a guaranteed wage, were included in the Nash settlement. Nash officials had no comment when asked whether the raise would be followed by a price increase on its products. However, in view of the Plymouth price reduction, it is considered highly unlikely that Nash will increase its prices.

What Do Workers Think? A New Way To Find Out

An interesting report in Detroit is that one of the major automotive corporations is planning to institute a new plan of opinion sampling among its workers. The project is in cooperation with the University of Michigan and the Rackham Foundation. The object of the program is to get a comprehensive sampling of workers' opinions on questions affecting labor management relations. Details are not available, but the method is said to incorporate indirect questioning which will throw light on the subject without raising prejudicial questions in the minds of individuals being interviewed. The method is opposite to that of the direct approach presently being used by Ford Motor Co. which invites comments from its employes on matters pertaining to relations with the company.

Packard Foremen Make Stiff Wage Demand

Other automobile manufacturers are watching with considerable interest the outcome of negotiations between Packard Motor Car Co. and the Foremen's Association of America. Shortly after FAA won bargaining rights at Packard through a Supreme Court decision, it presented wage demands asking increases of $90 to $100 a month for its foremen members. Other demands include a union shop and dues check off, separation pay in event of lay offs, overtime pay, establishment of grievance machinery, and recognition of seniority.

Union Fights Cost Cutting Through Product Redesign

A parts manufacturer tells an interesting story about his experience in redesigning his product in order to get by with fewer hours of labor. By using two die cast pieces instead of a welded construction assembly, time and effort was cut considerably. However, the union refused to work on the item until the wage rate had been pushed up considerably. The manufacturer agreed to the increase provided there would be an increase in the production rate. After a two months' strike, the union finally agreed to the higher production rate so that at least some of the design advantage was realized.

(*Turn to page 74, please*)

New Ejector Device

By William A. Clegern, Power Plant Design Engineer, Consolidated-Vultee Aircraft Corp.

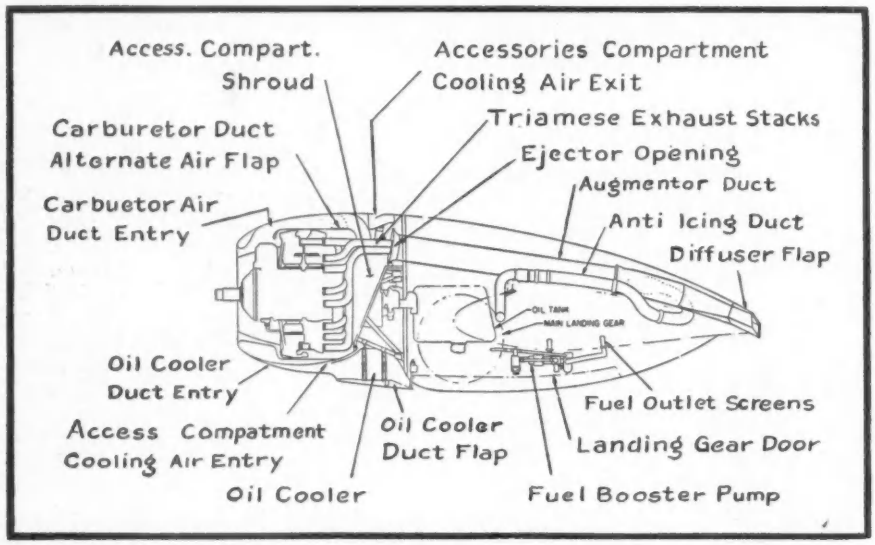


Fig. 1—This side view of the engine nacelle shows the exhaust ejector system on the Convair 240 airplane

***UTILIZATION of exhaust gas energy to increase air flow for engine cooling is a problem that has top priority with a number of research engineers and so far applications have been made in several aircraft engine installations. One of the newest systems to be developed is described in this article. This engine cooling method also has some advantages that make it feasible for automotive applications, particularly to facilitate cooling of rear engines in passenger cars and buses. One of the first articles on this subject, "Induced Air Flow for Engine Cooling," was published in the Feb. 15, 1946, issue of* Automotive *and* Aviation Industries.**

A NEW exhaust ejector, developed by Consolidated-Vultee Aircraft Corp., San Diego, utilizes exhaust energy to cool an aircraft engine, to give added thrust to the power output, and to provide hot air for cabin heating and the de-icing of aerodynamic surfaces. The new device eliminates cowl flaps, thus permits a cleaner arrangement of the radial engine installation which decreases form drag and eliminates cooling drag.

This exhaust ejector, as designed for the Convair 240 airplane, consists of a system of six stainless steel stacks discharging into two ejectors located inside the engine nacelle at the top. This arrangement is shown in Figs. 1, 2 and 3. The cylinder exhausts are linked in groups of three, so that each ejector opening receives the exhaust of nine cylinders from three stacks. Engine exhaust passes through the augmentor ducts and out through the diffusers. Flaps on the diffusers control the exit area; and cabin hot air ducts and de-icing ducts are provided in the system. The nacelle is a monocoque structure, extending from the wing's trailing edge to the fire wall which serves as a support for the cantilever cowl and the short tubular engine mount. The cantilever design of cowl permits quick and easy access to plugs, cylinders and the exhaust system. Located above the engine, and inside the cowl, is the carburetor

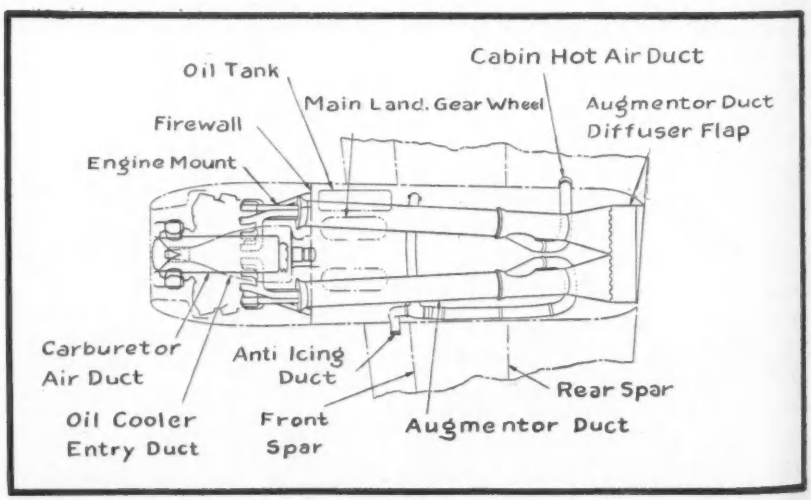


Fig. 2—Plan view of engine nacelle, showing the two exhaust ejectors on the Convair 240

Uses Exhaust Energy for Engine Cooling

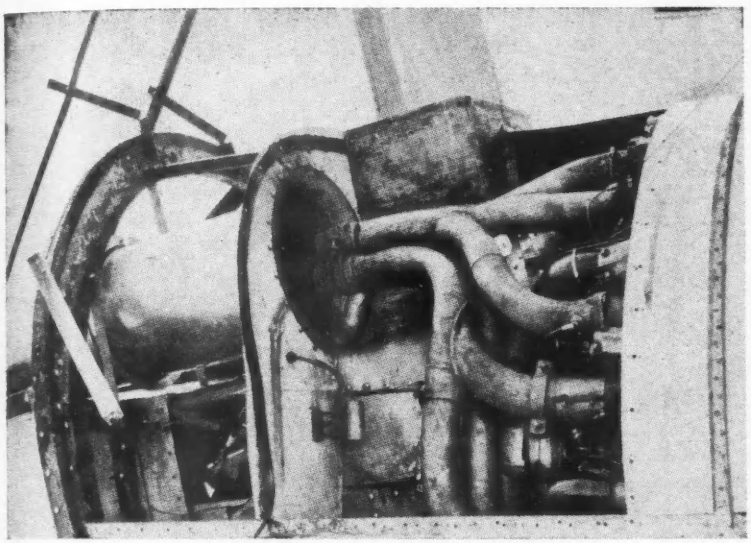


Fig. 3—This photo shows the triamese exhaust stack installation, which is a combination suction pump, thrust augmentor, pressure ejector, muffler and hot-air pump. Stacks combine cylinder exhausts in groups of three, so that each ejector opening receives the discharge of nine cylinders

and air at about 300 F and at approximately 80 per cent of the total head in the ejector. Ample pressure is available on the ground for de-icing the wing and heating the cabin. A heat exchanger is used for heat transferred to the cabin, but the ejector gases are piped directly to the aerodynamic surfaces. Cold air is added at the wing leading edge to prevent structural damage from overheat; and if front spar temperature should exceed 300 F, the hot air source is automatically restricted. A tail wind up to 30 mph or reversed propeller pitch does not affect the ejector performance appreciably.

Ground cooling with this ejector is highly satisfactory, being well below limits on a 100 F day and at any power, as shown by Figs. 5 and 6. Flight performance estimates show that the new system will provide a net thrust of ap-

air entry, as shown in Fig. 4. This type of flush-scoop protected entrance is also used for the oil cooler, which is placed below the engine. Residual heat doors are provided on both sides of the carburetor duct, and are opened only after engine shut-down on the ground, or when starting.

Operation of this power plant installation is foolproof to a greater extent than the conventional type. Starting is unchanged with the exception that the residual heat doors should be open to alleviate pressure rise from a possible explosion of fuel in the air passageway. Open diffuser flap is best for ground cooling on hot days; however, it is not at all fatal to start and warm up with the flap in trail or even closed position. Closed flap only reduces pumping capacity by 40 per cent.

Heat for the wings, tail and cabin is supplied from the ejector. Flush scoops in the aft section pick up the mixture of exhaust

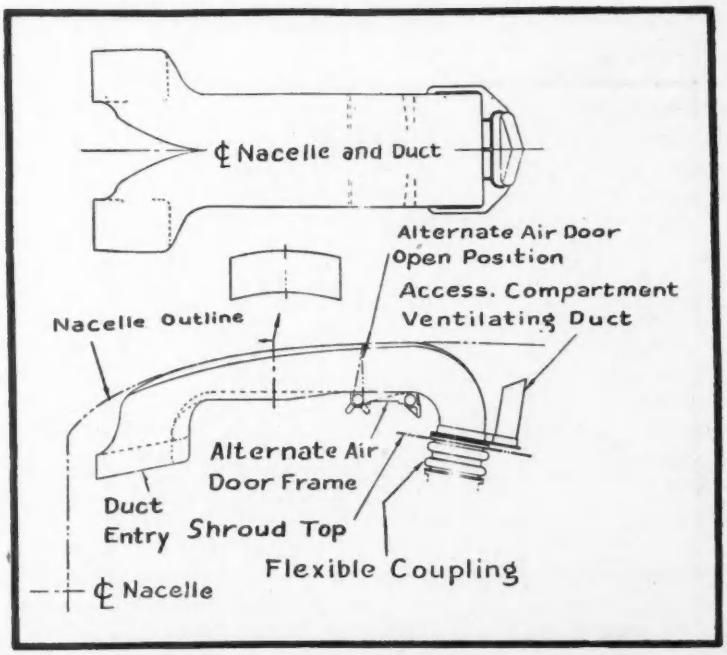


Fig. 4—This drawing shows the carburetor air duct

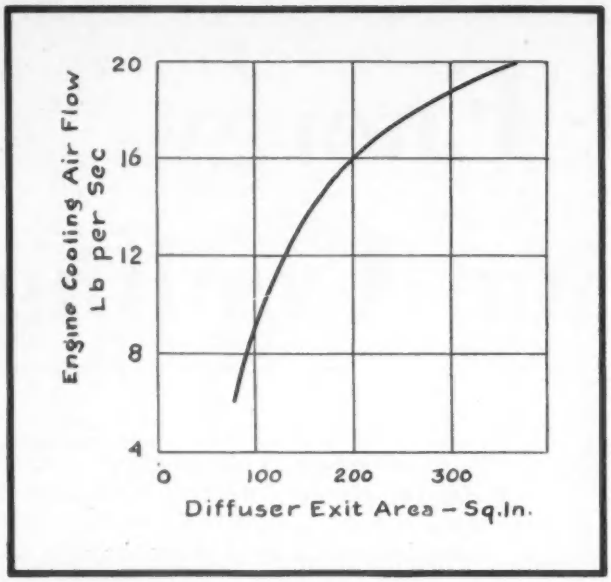


Fig. 5—Curve of engine cooling air flow vs diffuser exit area shows the effect of diffuser flap on the ejector's pumping capacity at sea level, 2100 bhp and zero ram

proximately 200 lb per engine at 115 mph in a full power climb. This is very effective for the single engine climb requirements, increasing payload as much as 2000 lb when compared to the conventional cowl flap-collector installation. Ejector thrust decreases with increasing speed. At 2100 bhp and trail diffuser flap, it falls off at approximately 0.7 lb per mph. By closing the flap, to maintain maximum allowable cylinder temperatures, this fall-off is decreased to 0.3 lb per mph. (See Fig. 7). Thrust increases with increasing altitude. In METO power climb the rate of increase is approximately 5 lb per 1000 ft. Air flow falls off with increasing altitude; but velocity, due to temperature and density changes, increases at enough faster rate to produce the thrust gain (see Fig. 8).

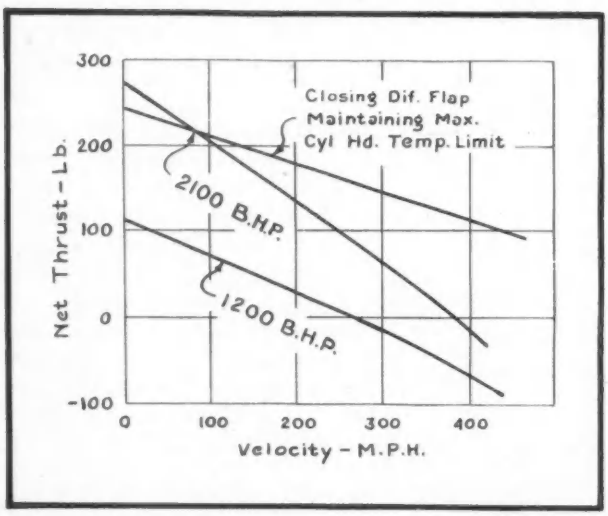


Fig. 7—Curves show effect of airplane speed on ejector thrust at 2100 bhp at sea level with trail diffuser flap

Power Plant Comparison for Convair 240 Airplane

	Cowl Flaps & Collector Ring	Cowl Flaps & Jet Stock	Exhaust Ejector
Max Pay Load—Single Engine Take-Off-Climb (lb)	8000	9300	10,000
Power Plant Thrust—Single Engine Meto Power Climb (lb)...	4210	4480	4580
Power Plant Thrust Per Engine Level Flight (lb)	1210	1330	1345
External Form Drag in Flight	High	High	Low
Ground Cooling	Poor	Fair	Excellent at any power
Flight Cooling	Fair	Good	Excellent
Cooling Control	Fair	Fair	Excellent
Passenger Cabin-Noise Rear Seats (1200-2400 cps octave) (db)	69	76	67
Airport Noise Over-All Level (db)	107	113	105
Appearance	Fair	Poor (dirty)	Excellent (clean)
Frontal Area (sq ft)..	26	26	22

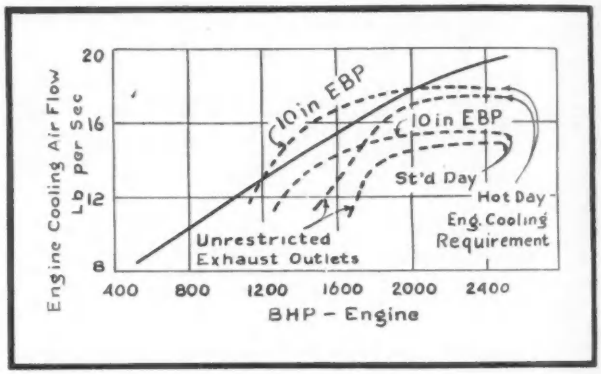


Fig. 6—Ground cooling characteristics of the ejector system are shown in this curve of engine cooling air flow vs bhp per engine under zero ram

At a constant power. however, the rate of thrust gain is not constant with increasing altitude because of increasing speed. The rate of thrust gain at 1200 bhp is reduced from 10 lb per 1000 ft at sea level to 1.5 lb per 1000 ft at 16,000 ft (Fig. 9). In level flight at 10,000 ft, 1200 bhp, the ejector net thrust of 100 lb per engine is calculated to provide a 10 mph speed increase over the conventional cowl flap-collector ring design. In climb and take-off the net thrust is down on the jet stack-cowl flap installation. With any opening of cowl flaps, cooling and form drag increase, rapidly overcoming the jet thrust at approximately one-third flap opening. The ejector has no form drag increase and comparably small thrust loss with opening of diffuser flap.

Assuming a 40-lb per engine heat exchanger (or combustion heater satisfactory for complete cabin heat and aerodynamic surface anti-icing) and reducing power

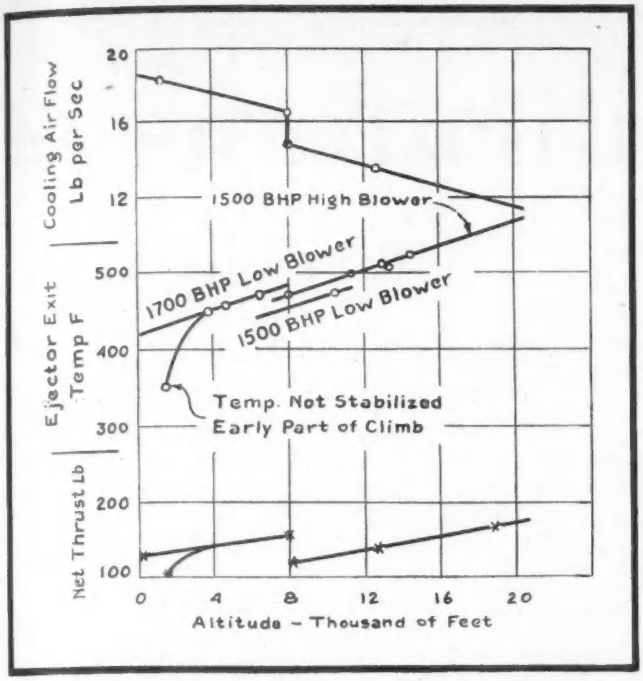
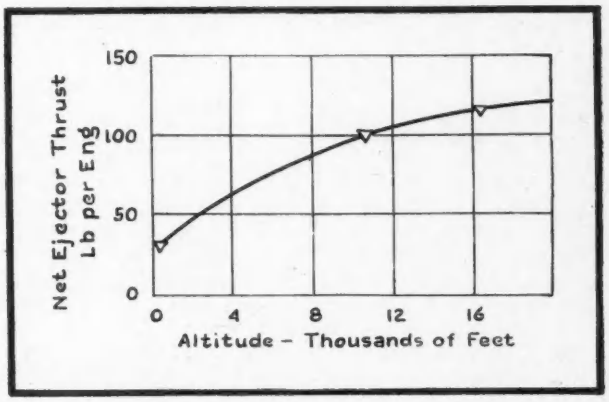


Fig. 8—Effect of altitude on ejector performance is given in these curves for METO power climb at 155 mph with trail diffuser flap

plant weight by this amount, the Convair 240 standard ejector system weighs 128 lb per engine; and with the ejector shrouds removed, weighs 100 lb per engine. Further weight deletion could be accomplished by replacing the stainless steel in the ejectors with aluminum alloy. However, with this known weight chargeable to the ejector, enough other compromises were eliminated, or improvements made, so that the total powerplant weight is 175 lb below the conventional installation.

Fig. 9—This curve shows effect of altitude on ejector thrust for level flight with 1200 bhp per engine



New British Engine

A NEW British two-stroke engine, the Trojan "65," designed for use in light delivery vans, develops a maximum torque of 69 lb-ft at 950 rpm. Maximum power is 24 bhp at 2300 rpm. The cylinder arrangement, shown in Fig. 1, consists of four working cylinders arranged in pairs, each pair sharing a common combustion chamber. Two separate pumping cylinders draw the fuel mixture from a Solex carburetor

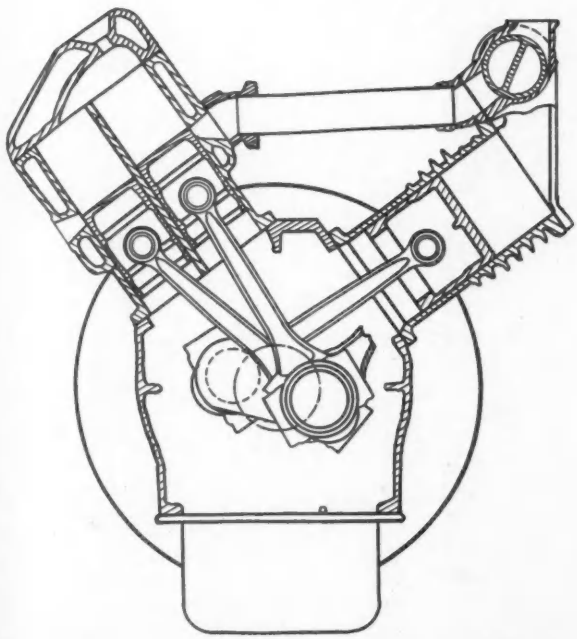


Fig. 1—Cutaway drawing of Trojan engine

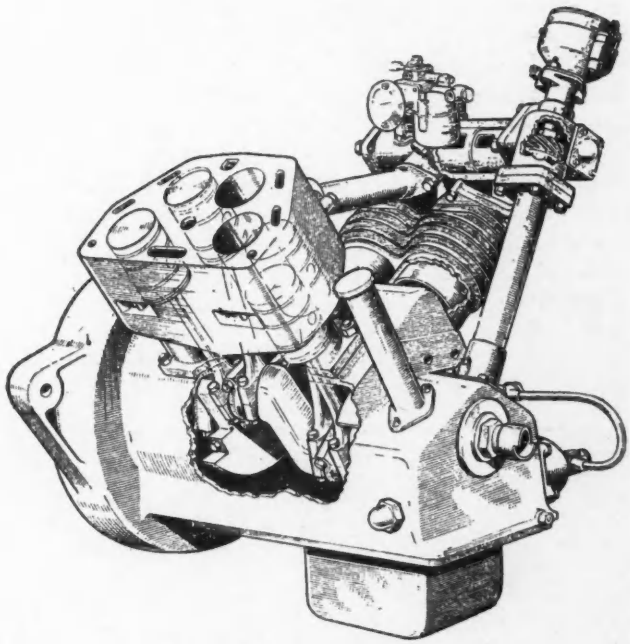
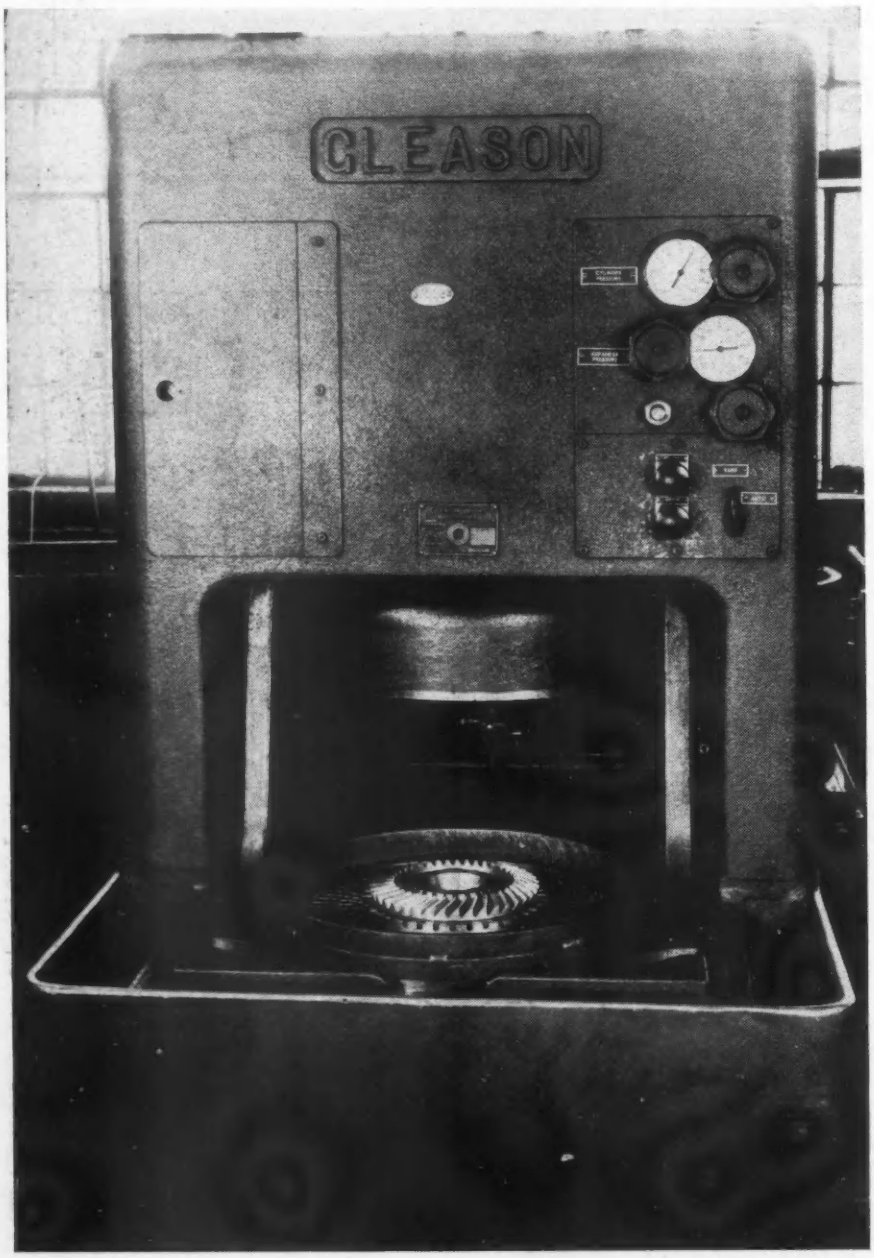


Fig. 2—Sectional drawing of Trojan

and deliver it via a crankshaft operated rotary valve to the two combustion chambers. The working pistons are cast iron. Fig. 2 shows how the exhaust port, controlled by the leading piston, opens well before the inlet port which is controlled by the trailing piston. This engine has a 72.3 cu in. displacement with 3.46 in. stroke, and working cylinder bore of 2.58 in. and pumping cylinder bore of 3.87 in. The two illustrations shown are reproduced through the courtesy of *The Motor* (London).

New Applications of

IN ITS applications to mass production the process of Roto-Shaving is newsworthy indeed. Among the most recent installations in the industry are three special Red Ring Roto-Shavers which are found in the post-war set-up at the New Process Gear Corp., Syracuse, N. Y., producers of transmissions, differentials, and rear axle gear sets. This company has recently revamped its manufacturing facilities to meet the challenge of accelerating volume and the demand for greater cost economy, requirements which can be satisfied only through the adoption of modern methods coupled with an increasing use of improved materials handling.



Front view of one of several new Gleason quenching machines installed in the New Process heat treating department. A gear is shown in place in the fixture which is arranged to move forward automatically for loading, move under the ram for quenching, and return to unloading position after the cycle has been completed.

The machine shown in Fig. 1 is tooled for finishing the back face of rear axle ring gears. Common practice for years has been to finish this face by grinding to secure proper flatness and nicety of surface quality. By the new method illustrated here, the face is finished to the required flatness and finish in a single setting in the machine with the removal of about 0.010 in. of stock from the rough turned blank. This operation eliminates grinding and turns out 120 pieces per hour which is said to be faster than any previous method.

Ring gears are held in a power-operated chuck while piloted on the bore. The part is automatically clamped by push button which also starts the cutting cycle. Changes of cutter and pilot plug permit quick changeover from one type of gear to another.

Two unique Red Ring machines are features of the differential case department. The one shown in Fig. 2 is set up for finishing the flange diameter

Roto-Shaving
in Mass Production Increase Output and Cut Costs

and face to required dimensional tolerances, axial alignment, and finish in one setting. The other, Fig. 3, is so tooled as to finish simultaneously the outside diameter of both hubs as well as the shoulder. It is of interest to note that diameters are readily held to a tolerance of 0.001 in.

According to the management, by replacing grinding, the shaving process has increased productivity quite materially, and has aided in reducing machining cost since only one semi-finish turning operation is required.

An innovation in the heat treating department is the adoption of the new type of Gleason gear quenching machine which is said to have many advantages over the older and more familiar Gleason equipment. The new model, Fig. 4, is modernly styled and provides a fully automatic cycle. In operation, the work-holding table indexes forward to facilitate loading of work, then ad-

(*Turn to page* 68, *please*)

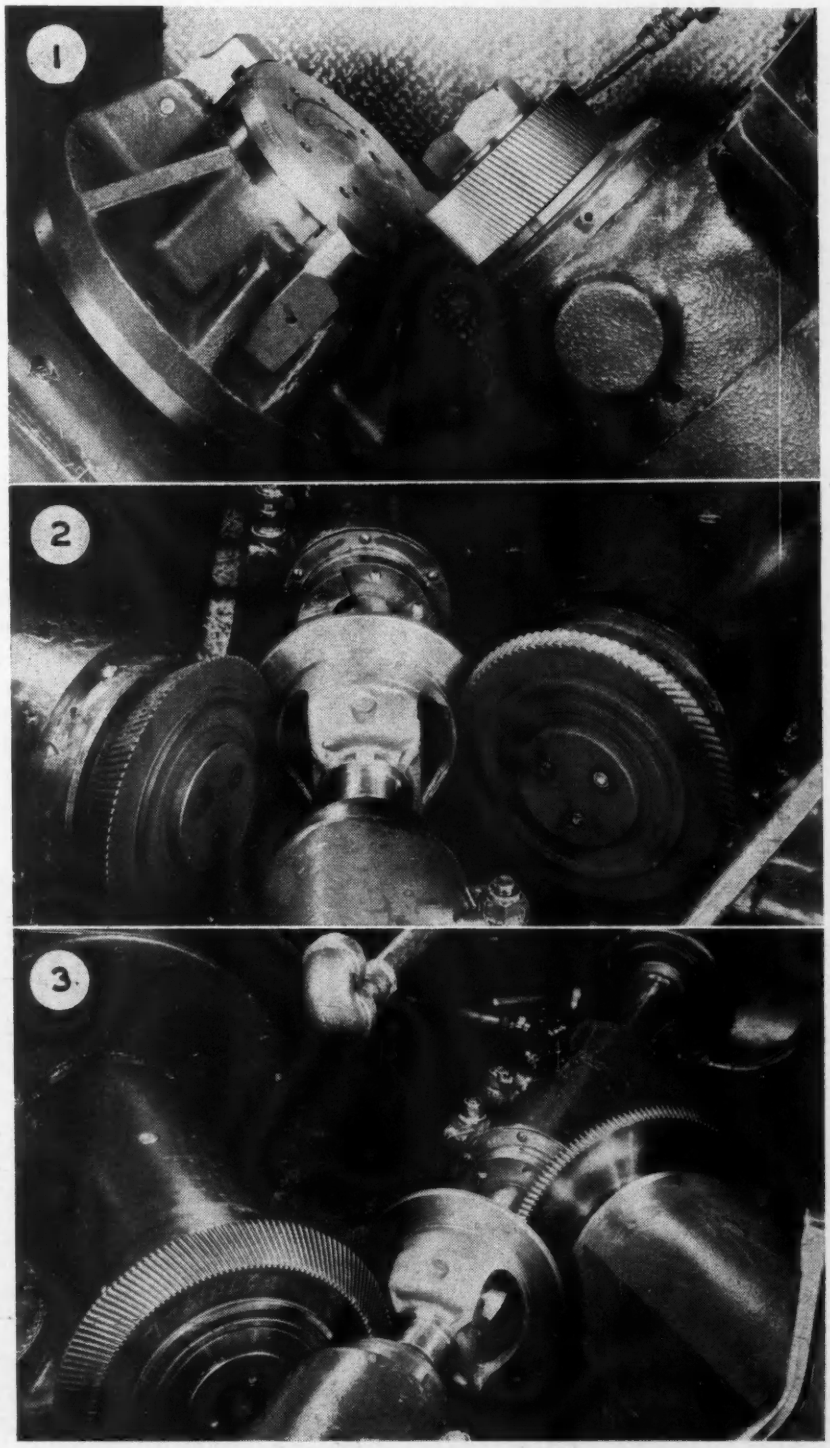


Fig. 1. Close-up of work station of National Broach Roto-Shaver tooled for finishing the back face of rear axle ring gears. The ring gear is held in a power operated chuck at the left while the shaving tool may be seen at the right of the gear. Floor-to-floor time of about 17½ sec. a piece produces a finish replacing the former practice of grinding.

Fig. 2. Red Ring Roto-Shaver equipment for finishing the ring gear pilot diameter and flange on a differential case. The cutter at the left finishes the flange while the one on the right does the pilot. This operation performed automatically eliminates grinding.

Fig. 3. Another variation of the Red Ring Roto-Shaver is arranged for cutting the hub diameter at both ends, at the same time finishing the shoulder. Note the angularity of cutter mounting to accommodate teeth on the edge for finishing the shoulder. This setup, eliminates conventional grinding operations on this part.

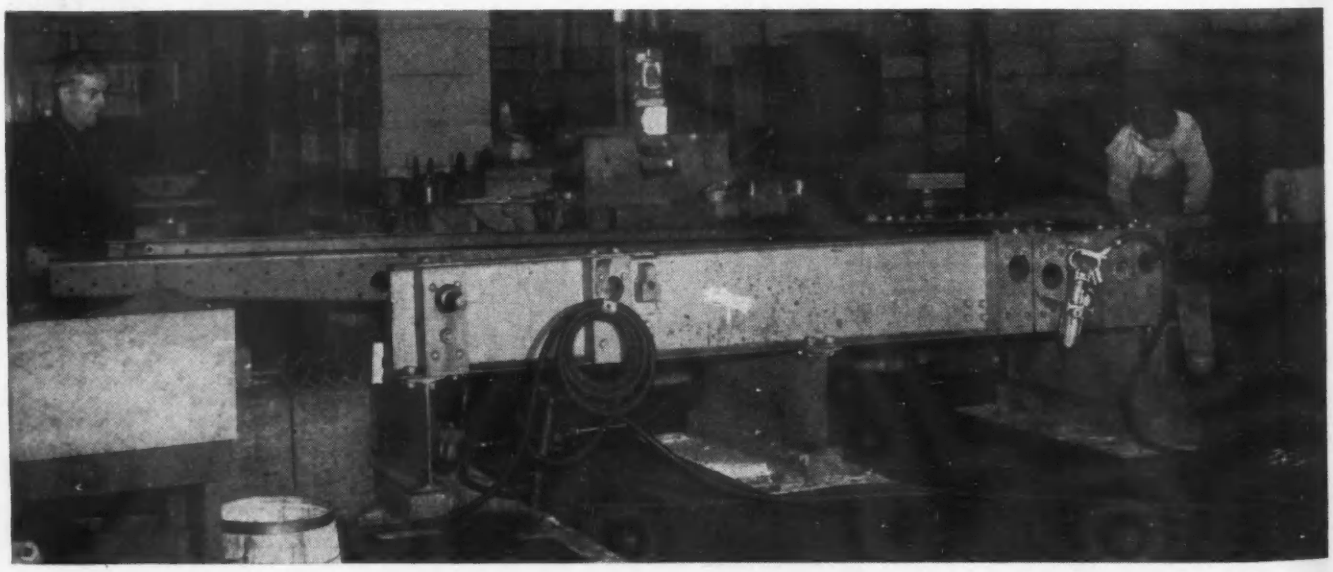
Advanced Heavy Duty

New Techniques, New Equipment Give Improved Quality at Lower Costs in Autocar's Reorganized Plants

DISTINGUISHED as one of the oldest names among the motor truck producers, The Autocar Co., Ardmore, Pa., is a specialist in the manufacture of heavy duty vehicles exclusively. At the present writing Autocar lists ten basic chasses, with a minimum rating of 26,000 GVW and no top rating within practical limitations. Since each vehicle is practically custom built to the requirements of the individual buyer it is no mean accomplishment to have a current manufacturing schedule of approximately 26 vehicles per day on the average.

Autocar trucks are not assembled in the usual sense of the term. Except for the largest off-the-highway vehicles, Autocar makes its own engines, transmissions, rear axles, auxiliary transmissions, cabs, and other parts. And even the frames are drilled and assembled here. The manufacture of such major components requires extensive plant facilities, accounts for the large increase in floor space and equipment in recent years, including a number of new buildings erected during the war.

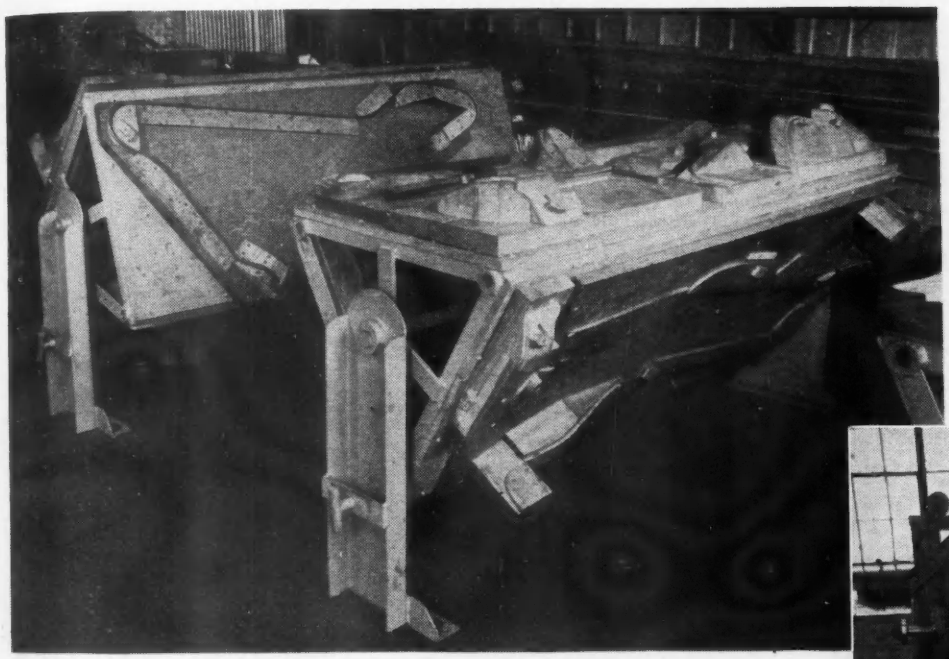
Since the conclusion of the military vehicle program Autocar has undertaken an ambitious program leading to a complete reorganization of departments for making engines and transmissions. The changing layout of these departments will accommodate many items of machine tools of advanced type which will give the organization the benefit of improved quality at lower costs. A sampling of new equipment to be mentioned



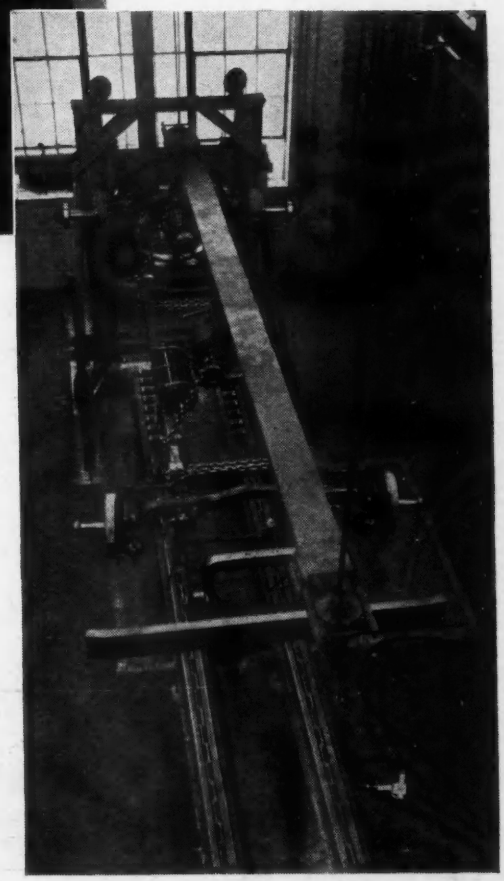
First major operation on the first floor is the assembly of chassis frames in the so-called squaring fixture. All frames are made up in this fixture and then transferred to the start of the conveyorized chassis line located directly to the right.

Methods in Truck Building

By Joseph Geschelin



Here are two of the ingenious fixtures devised for producing tubing bent to fit the requirements of an individual chassis. Each fixture contains a variety of layout tools which permit the bending of tubing of any size and length and form.



Birdseye view of the end of the chassis line on the first floor, looking through the opening to the final line on the floor above. The chassis is being turned over by means of the fixture in the background before being hoisted up.

later will give the reader a better impression of the type of machinery earmarked for the program of improvement.

At the time this article was prepared the company had placed in operation its new chassis and final assembly line. Completely mechanized and boasting features comparable to the most advanced lines in the industry, the assembly line forms the basis for this study.

Assembly operations take place on two floors of the new assembly building with frame and preliminary chassis assembly on the first floor, final assembly and inspection on the second floor. Frame side rails and cross members come in from outside suppliers, are drilled, reamed, bored, etc., in preparation for frame assembly, using radial drills and standard drilling templates. This work is done in a department to one side of the frame as-

Sample of Car Building Record form.

THE AUTOCAR CO. **CAR BUILDING RECORD** ARDMORE, PA.

Note: All items shown on this CAR BUILDING RECORD replace those shown on the BASIC SPECIFICATION Sheet.

ENGINE	4 1/4 x 5 1/4		UBW30510	BKTS. Steering Column		10	0231	CABLE, Speedo. Series	16 0800
GOVERNOR		2		ARM, Pitman		10	0206	ADAPTER, Speedo. Ratio	16 Non e 0601
				LINK, Drag		10	010		
FILTER, Oil		2	0807	FRAME		12	AUSA 010 G	GEAR, Spd. Driven	16 E 0571
CLUTCH	2-32-6	3	BX 030	RAILS, Undrilled		12	0112	FLOORBOARDS	17 0600
TRANS., Main		3		REENFORCEMENT		12	0240	TRANS., Aux. Ratio	19 0420
SHAFTS	Front	30		GUARD, Radiator		12	0140	CONTROL Inst.	10 01920
	Inter	30		SPRINGS	Spring	13	009	F. Wheel Assy.	25 0220
	Rear	30			Mounting Inst.	13	0300	R. Wheel Assy.	25 0230
BRG. & Hsg. Assem.		3	0250		Clip	13	042	BRAKES	Hand. Assy. 25 01220
					Shim	13	014		Disc 25 0401
FLANGES	Main Trans.	3			Thick end				Sketches: Hand:
	Aux. Trans. F.	3							Trailer Conn:
	Aux Trans. R.	3		FROM	Keeper	13	043		Type
	F. Stdy. Brg.	3			Spring	13	011	ROD Inst., Radius. F.	26 0400
	R. Stdy. Brg.	3			Mounting Inst.	13	0310	ROD Inst. Radius. R.	26 0500
	Rear Axle	3			Clip	13	041	SHOCK Absorbers No. Hole up.	28 0200
AXLE Assem., Rear Model		4	Ratio 8.61		Keeper, Clip	13	092	WHEELS	F. Wheel & Drum 11
RADIATOR		5	VZ 090 D		Plate, Clip	13	0111		R. Hub & Drum
FAN (")		5	0130		Shim	13	0114		R. Wheel & Drum 11
PUMP, Water		5	0770		Thick end				R. Hub & Drum
CARBURETOR		6	MS 060		Spring, Aux.	13	0156		Brg. & Seal Inst.
CLEANER, Air. Install.		6			Brackets Clr.	13	0153		Rim (Size Disc (Type
PUMP, Fuel		6	0510						Tire Size
TANK & Mtg., Fuel Location	Between frame at rear	6	CB 0580						Tire Make
TANK & Mtg., Aux. Location		6						PAINT	
LINES Install., Fuel		6	AAC 01370	FENDER		14	052	Trans. Serial No.	
MUFFLER		7	J 010	GUARD, Splash		14	021	Cab Serial No.	
PIPE, Exhaust EXTENSION		7	EC 040	BOARD, Running		14		WHEELS	Ignition
COIL, Ignition V.		8	0120	BKT., Running Bd.		14	001		Battery Box
DISTR. & Gear Assy.		8	0470	BRACE, Run. Bd.		14	078		Tool Box
GENERATOR V.		8	0740	BOX Inst., Battery Location		14	0300		Cab Door
REGULATOR, Volt. V.		8	0780	BOX Inst., Tool Location		14	0460	TOE-IN	
MOTOR, Starting V.		8	0750	SHELL & Grille		14	0750	CASTER	R.H.
BATTERIES ( )		8	0840	HOOD Assem.		14	0710		L.H.
HEADLAMPS		8	01021	CAB Install.		15	0800	WHEEL Cush.	R.H.
WIRING Diagram		8	01170	SHUTTER, Radiator		14	0660		L.H.
AXLE Assem., Front		9	0990	TOOL Kit		18	03250	WEIGHTS, Front	
ARM, Steer. Spindle		9		CARRIER, Tire		16		Chassis Rear	
GEAR, Steering Mgt.		10	0770	BUMPER				Total	
								DATA	Issued 12-8-46
									Built
									Shipped
									Shop List 17914
									Shop Instruction 17914
									Design Record Engineered by L-204 Penn

SPECIAL ITEMS:— Tow hooks front - 1EU0500 applic.
Tow hooks rear - 1EC35188-29.

To conform to N.Y.C. Fire Dept. Spec. for hauling fuel Oil see E30-1.

For all items not shown above see BASIC SPECIFICATION Sheet No. CBR— U70J - 148 - 1

CUSTOMER North Side Fuel Oil Co. BRANCH New York

Model U70J Wheelbase 148" Frame Length (C/E) 192"

Branch A.O. No. 36 Sales Order No. 17914 Chassis No. U70J-

THE AUTOCAR CO. **BASIC SPECIFICATION** ARDMORE, PA.

The purpose of this BASIC SPECIFICATION sheet is to show basic items only. See Car Building Record for all items, not basic, replacing those shown below. Use this sheet only for items NOT shown on Car Building Record.

ENGINE	805 4-1/2-3 1/4		UCBWA 0990	BKTS. Steering Column		10	AA 0231 L 10 AA 0231 R	CABLE, Speedo. Series	16 18 0800
GOVERNOR		2	CB0700A	ARM, Pitman		10	UN 0206	ADAPTER, Speedo. Ratio	16 BZ 0601
FILTER, Oil		2	E 0807	LINK, Drag		10	ZUPE 010 C	GEAR, Spd. Driven	16 C 0571
CLUTCH	2-31-6	3	B 030 B	FRAME		12	AUSA 010 C	FLOORBOARDS	17 UF 0500
TRANS., Main		3	UTP020A	RAILS, Undrilled		12	H 0112 L 12 T 0112R L	TRANS., Aux. Ratio	19 None 0420
SHAFTS	Front	30	DE5632B	REENFORCEMENT		12	None 0240	CONTROL Inst.	10 None 01920
	Inter	30	None	GUARD, Radiator		12	None 0140	BRAKES	F. Wheel Assy. 25 W 0220 LAR
	Rear	30	None	SPRINGS	Spring	13	G 009 A		R. Wheel Assy. 25 W 0230 LAR
BRG. & Hsg. Assem.		3	None 0250		Mounting Inst.	13	D 0300		Hand Assy 25 BF 01220
FLANGES	Main Trans.	3	UCA0201		Clip	13	ZTE 042		Disc 25 H 0401
	Aux. Trans. F.	3	None		Shim 1-1/2°	13	AE 014		Sketches: Hand: 2700
	Aux Trans. R.	3	None		Thick end		Rear		Trailer Conn. None
	F. Stdy. Brg.	3	None		Keeper	13	M 043		Type PBU-4
	R. Stdy. Brg.	3	None	FROM	Spring	13	C 011 AL 13 C 011 AR	ROD Inst., Radius. F.	26 None 0400
	Rear Axle	3	UCA0201		Mounting Inst.	13	D 0310	ROD Inst. Radius. R	26 None 0500
AXLE Assem., Rear Model	TK	4	TK 0300 Ratio 7.28		Clip	13	ZC 041 B	SHOCK Absorbers No. Hole up.	28 None 0200
RADIATOR		5	UCB 090 E		Keeper, Clip	13	TEA 092	WHEELS	F. Wheel & Drum 11 E 0160
FAN (22")		5	UN 0130A 468A		Plate, Clip	13	TE 0111		F Hub & Drum F 5724
PUMP, Water		5	B 0770		Shim 1	13	TG 0114		R. Wheel & Drum A0205
CARBURETOR		6	CB 080 A		Thick end		Rear		R Hub & Drum R7118
CLEANER, Air. Install.		6	UG 0440A		Spring, Aux.	13	TE 0156 A		Brg. & Seal Inst. F0250
PUMP, Fuel		6	H 0810 C		Brackets Clr. 2"	13	CE 0153		Rim (Size 20x7.33V(11L075) Disc (Type HD Tire Size 11.00-20
TANK & Mtg., Fuel Location	Left Rear	6	HOISOL 142 gals	FENDER		14	UGA 052 L 14 UGA 042 R		Tire Make
TANK & Mtg., Aux. Location		6	None	GUARD Splash		14	None 021	PAINT	Olive drab
LINES Install., Fuel		6	GH 01370	BOARD Running		14	U0230B 14 U 0240R		
MUFFLER		7	CBA010	BKT., Running Bd		14	001		
PIPE, Exhaust EXTENSION		7	UH 003 B UDC 040	BRACE, Run. Bd		14	None 078		
COIL, Ignition	Opt. 12 V.	8	0120 See CoBoRo	BOX Inst., Battery Location		14	UGA 0740		
DISTR. & Gear Assy.	Opt.	8	0470 See CoBoRo	BOX Inst., Tool Location		14	UGC 0300 R		
GENERATOR	Opt. 12 V.	8	0740 See CoBoRo	SHELL & Grille		14	None 0460		
REGULATOR, Volt.	Opt. 12 V.	8	0780 See CoBoRo	HOOD Assem.		14	None 0750		
MOTOR, Starting	Opt. 12 V.	8	0750 See CoBoRo	CAB Install.		14	None 0710		
BATTERIES (2)	XG-17	8	F 0840	SHUTTER, Radiator		15	UGB 0800		
HEADLAMPS		8	01021	TOOL Kit		14	None 0660	TOE-IN	0-1/4
WIRING Diagram		8	UG 01170	CARRIER, Tire		16	DF 03250	CASTER	1-1/2° to 1/2° P
AXLE Assem., Front	27455	9	WC 0990	BUMPER		16	K0670	Shop Instruction List	548
ARM, Steer. Spindle		9	U 075A				16U48378	Design Record Engineered by	548
GEAR, Steering Mgt.	32-7/8°	10	SR 0770 T-71						

BASIC SPECIFICATION Sheet No. CBR— U70G-148-1

November 11, 1946

Model U70G Wheelbase 148" Frame Length (C/E) 192"

Newest acquisition in the motor department is the battery of two six-spindle Ex-Cell-O inclined head precision boring machines for boring cylinders.

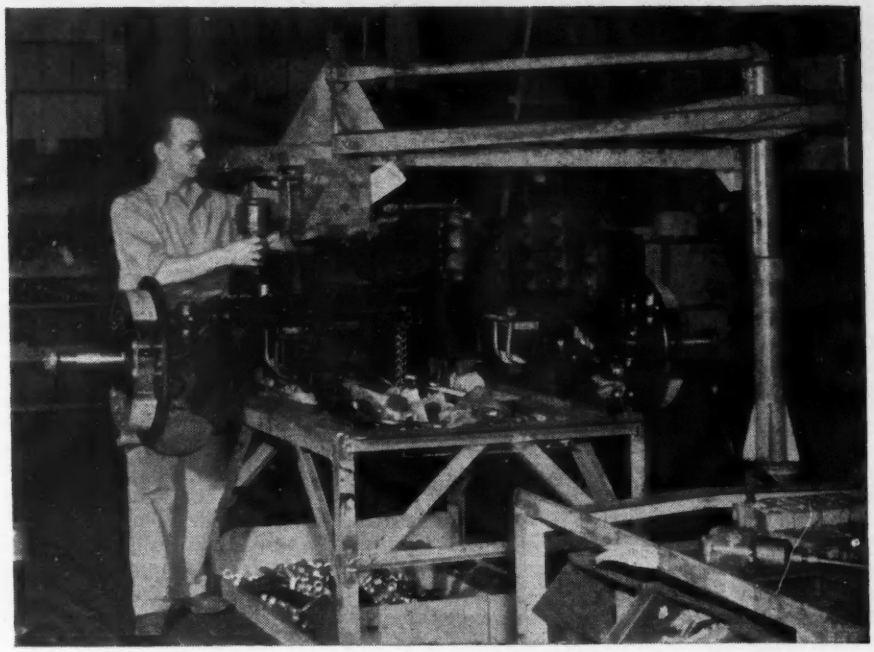
sembly line.

Frame assembly starts with the "squaring" fixture, a massive steel framing jig capable of adjustment for the entire gamut of frame sizes. Here they line up the side rails and principal cross members, complete the drilling and boring of special holes and make up the preliminary fastenings which produce a properly aligned frame. Incidentally, Autocar frames are put together with threaded fastenings exclusively. There is no riveting or welding anywhere in the structure.

Upon completion of squaring fixture operations the frame is lifted out by

DUTY TRUCKS

Continued



One of the major sub-assembly lines feeding the chassis line on the first floor is the front axle assembly shown here.

hoist and transferred to the conveyor line up-side-down to facilitate installation of running gear elements. From this point on until the end of the line the operator at each station adds cross members, hangers, brackets, and special attachments as specified on the car building record. Wherever an auxiliary transmission is specified it is installed at an early station on this line. One of the unique operations is the spot painting of the chassis at the front end around the engine mounting section. It is done at this point to assure a good job since the section around the engine is quite inaccessible for spraying after engine installation.

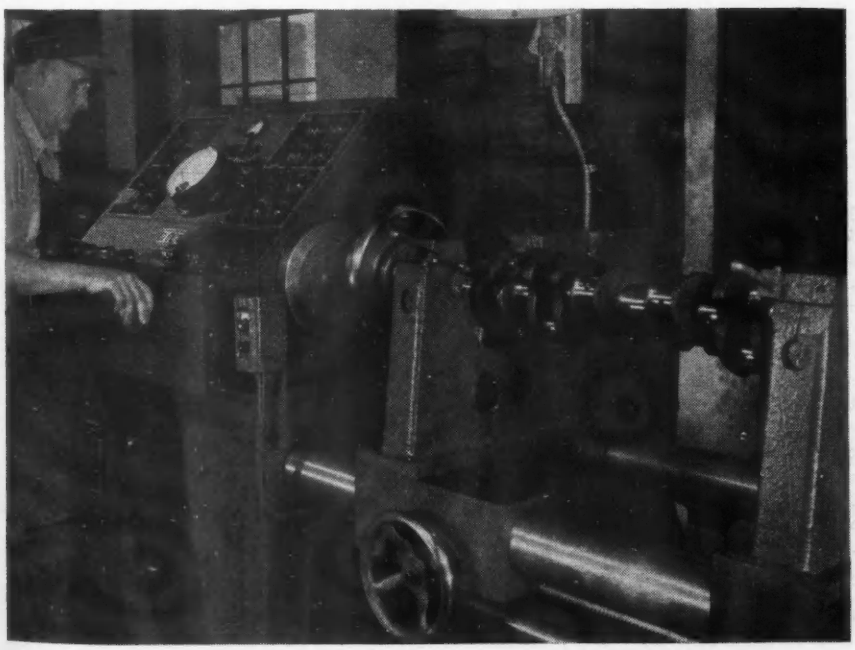
Among the major sub-assembly stations on this line are the ones for front and rear axles. The front axle assembly department is located at right angles to the chassis line. Here the operators make up assemblies in accordance with the building schedule, attach springs, brake cylinders, tie-rods, and other items to produce a complete self-contained assembly. As a given chassis reaches the front axle station, the proper axle is lifted by hoist and transported by rail to the assembly line for installation.

Farther down the line we reach the rear axle assembly department. This is a more extensive operation since rear axles are built up completely from component parts, taking into consideration the variations in models, gear ratios, and special equipment. Differential carriers are made up on benches at one side then transported to the axle assembly line on which the final assembly is integrated. Then the axles are run in and inspected. As in the case of front axles, the proper unit is scheduled to the line as the chassis approaches the station, hoisted and transported for installation.

It may be noted at this point that hoists of various kinds are provided throughout the plant to facilitate the handling of heavy loads and to relieve workers of manual tasks. Along the assembly lines described here, each of the sub-assembly stations is provided with a suitable hoist mounted on an overhead rail which carries the units directly over the line. It is important, therefore, to have the proper coordination of conveyor speed and sub-assembly installation to permit the use of the hoist at its station.

With the completion of running gear installation the chassis is ready for the final assembly line overhead. As the chassis reaches the end of the line a

(*Turn to page* 60, *please*)



One of the advanced pieces of equipment in the plant is this new Gisholt Dynetric crankshaft balancing machine.

Airbriefs

by Robert McLarren

Noise Reduction Progress

Following announcement last fall of basic theoretical study of the problem of propeller noise reduction by the National Advisory Committee for Aeronautics, numerous developments have hastened the day of the "quiet" airplane. Sensenich Corp., lightplane propeller manufacturer, has announced an extensive development program on three and four-bladed lightplane propellers for 85 and 150 hp engines. Several experimental models are now being flight tested. Aeromatic Propeller Div., Koppers Corp., has completed preliminary studies of multi-bladed lightplane propellers which reveal increased cost and weight inherent in the type. Luscombe, Cessna and Stinson Div., Consolidated Vultee, have placed orders for multi-bladed propellers for experimental flight test with their new models. Latest development is the announcement of a joint development program by Harvard, M.I.T. and NACA for the fabrication and flight testing of NACA theories on propeller noise reduction.

Propeller Responsible

NACA data, developed by T. Theodorsen and A. Regier of the Langley Laboratory Physical Research Division, blames the propeller for 90-95 per cent of airplane noise. This noise is created by the tip speed of the propeller encountering compressibility effects near the speed of sound. A major portion of the solution lies in slower-turning propellers which keep the speed of the tips well below sonic speed. This, in turn, requires additional blades and additional area per blade to provide the equivalent thrust needed for propulsion. Design studies indicate that a multi-bladed, fan-type propeller can render a lightplane virtually inaudible from a distance of 300 ft.

Industry Reluctance

Both the lightplane and propeller industries point out, however, that this major change would increase both the cost and weight of propellers, Aeromatic stating that a 3-bladed propeller would cost two to three times as much as the conventional 2-bladed and a 4-bladed at least three times as much as the 2-bladed propeller, largely because of the adjustable pitch feature required. NACA believes, however, that the thinner blade required coupled with a simple and inexpensive pitch-changing mechanism could conceivably reduce the increases to a negligible amount. The lightplane manufacturing industry frowns on any further cost increases in purchased equipment, pointing to one-third increases in such items in the past two years. They are also fearful of possible decreases in performance resulting from a change in propeller design.

Small Airport Problem

All groups are agreed that airplane noise is the major stumbling block in the path of the CAA's airport construction program in which Government funds must be matched by local municipal funds, the latter requiring bond issues and public support in most cases. The CAA, however, supported by the Aircraft Owners and Pilots Association and other groups, is seriously considering legislation requiring a maximum permissible noise level for aircraft licensing and airport use.

Transport Also Guilty

The Personal Aircraft Council, Aircraft Industries Association, points out that multi-engined airliners create considerably more noise than small private aircraft. CAA has answered this problem by re-routing the approach and holding patterns over close-in airports in such a manner that takeoffs and landings will be made over industrial and non-residential areas of cities. Grover Loening, aviation consultant, believes that noise reduction must start on the design board and that transport manufacturers must assign noise experts to preliminary design of transports if aviation is to expand.

Action Assured

Continued research by NACA, CAA and universities, development of prototypes and flight testing of experimental models coupled with light aircraft manufacturing interest will assure rapid solution to the noise problem. Once this major objection to the "close-in" airpark is overcome, flying can continue its phenomenal expansion.

Jet Bombers Here

First test flight last month of the North American XB-45 all-jet bomber ushers in a new era in aviation. The Consolidated Vultee XB-46 has completed taxiing tests and will fly shortly. The Martin XB-48 and Boeing XB-47 models, both with six jets, and the Northrop YB-49 8-jet Flying Wing, are scheduled for test flight this year. More important is the announcement of an AAF contract to North American for the manufacture of 96 B-45's at a cost of $73,900,000. The XB-45 and XB-46 are generally similar in design with two J-35 axial-flow turbojet engines mounted in a special twin nacelle under each wing. The wing is a special thin laminar-flow design developed exclusively for these two bombers. Speeds are expected to be in the 500 mph category with range comparable to the wartime heavy bomber (3000 miles). A feature of these jet bombers is cockpit refrigeration, which maintains the cabin about 30 deg cooler than the outside air, due to the friction heating effects of very high speed at low altitudes.

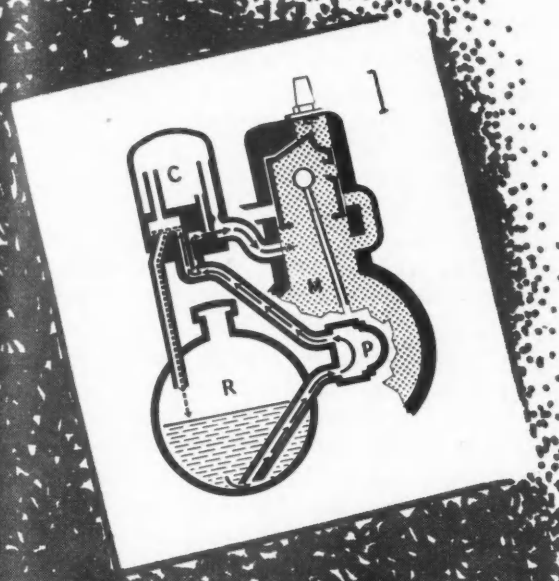
Expanding Jet Engines

Allison Division, General Motors Corp., has been in production on the General Electric J-33 and J-35 turbojet engines for many months and has recently completed design work on an improved version of the J-33 (wartime I-40 developed by GE). Allison now has complete responsibility for the J-33 type, which it has produced since late 1945, including engineering. In the meantime, GE continues development work on the TG-100 project as well as several new and more powerful gas turbine engines. Wright Aeronautical Corp. is now nearing completion on research and test facilities for jet engines costing over $4,000,000 and now has 1200 engineers at work on new jet engine designs. Four test units of the Wright turboprop engine, which develops 5500 horsepower, are now undergoing bench runs and flight tests are scheduled in a Boeing B-17 this summer. The engine will be mounted in the nose of the four-engined craft, which will retain its four Wright *Cyclone* engines. The Wright turboprop features two stages of compression and two turbine stages. Pratt & Whitney Div., United Aircraft Corp., has broken ground for a new multi-million dollar gas turbine research laboratory at East Hartford, Conn. The new facilities will contain two compressor test units and a power gen-

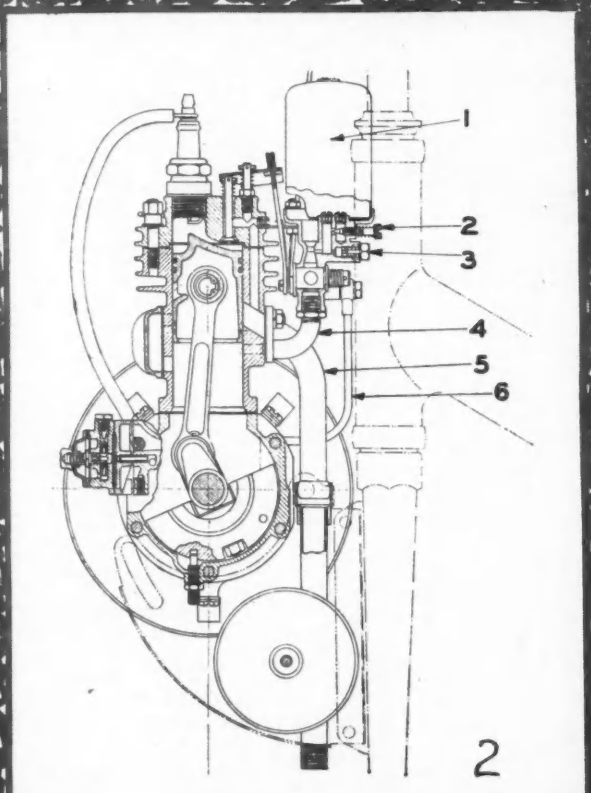
(*Turn to page* 58, *please*)

New Small Engine Design

Two-Stroke Single Cylinder Equipped with Floatless Carburetor and Diaphragm Pump Actuated by Pulsations in Crankcase



A FLOATLESS carburetor has been developed by the Solex Carburetor Co. in France and is now in use on an unique two-stroke engine which was designed especially for this new carburetor. The device contains neither float chamber nor needle valve, the gasoline level in the carburetor being maintained by a fuel pump and an overflow pipe to the gasoline tank. A diaphragm pump delivers the fuel mixture to the cylinder under pulsations from differences of pressure in the crankcase. General details of the carburetor and the two-stroke engine, which is of one-cylinder design for powering bicycles, are illustrated here



1. ***This schematic diagram shows the principle of operation of the floatless carburetor and the single-cylinder two-stroke engine. C is the carburetor; M is the engine; P is the fuel pump; and R is the gasoline tank. The overflow back to the tank is represented by the dotted line; and the arrows show the path of the fuel from the tank to the carburetor, and into the crankcase. The full mixture passes into the combustion chamber by means of the U passage at the right and the port in the piston. The exhaust port is shown to the left of the piston***

2. ***Transverse sectional view of the two-stroke bicycle engine with the floatless carburetor. The air inlet muffler is shown at 1; mixture adjustment screw at 2; cone-seated jet at 3; intake manifold at 4; exhaust pipe at 5; and gasoline feed pipe at 6. The gasoline is delivered to the carburetor through the cone-seated jet, the mixture then passing to the inlet port of the engine***

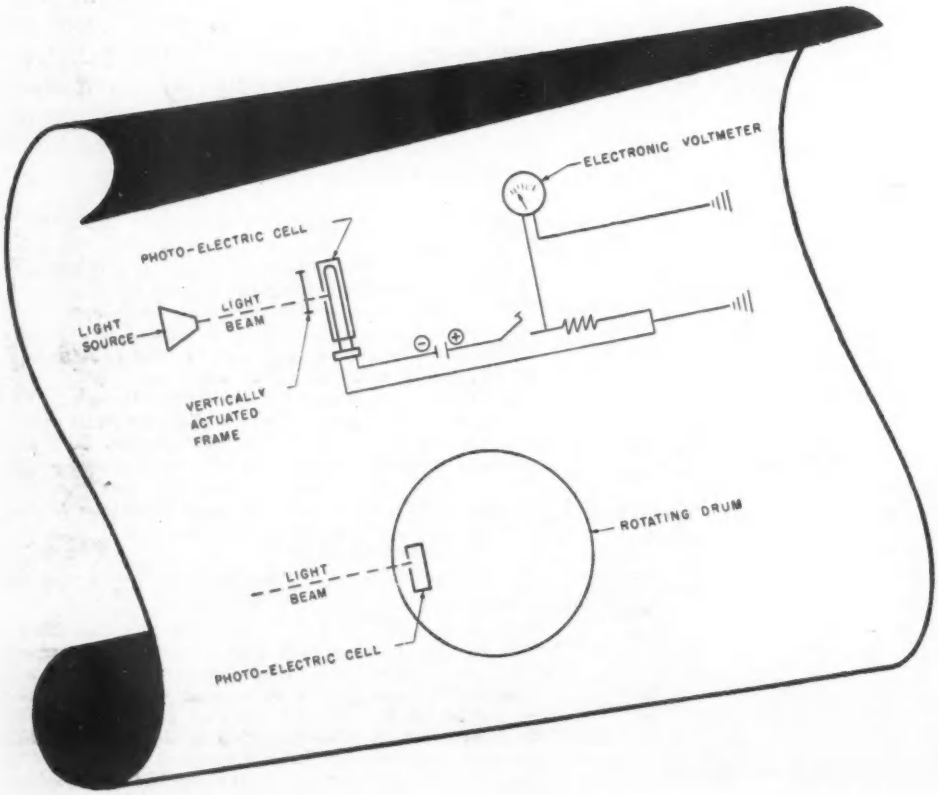
New Replica

Two new, replica methods of evaluating surfaces finishes of engine parts subject to wear have been developed recently. One, a National Bureau of Standards process which was developed by H. K. Herschman of its Metallurgy Division, is based on the use of a plastic replica which reproduces in minute detail the protuberances and recesses of a surface, and a photoelectric means of evaluation. The other, developed by the NACA Aircraft Engine Research Laboratory, also uses a plastic replica, but the examination is made by a microscope.

In the National Bureau of Standards process, the plastic replica is produced by applying a suitable solvent, or solution of plastic in solvent, to the test surface and pressing on a strip of clear plastic film. When dry the film, or replica, is readily stripped from the surface. The evaluation consists essentially in passing a restricted beam of light through an oscillating replica, thence through a suitably restricting diaphragm onto a photoelectric cell. The replica is oscillated with respect to the light beam in a straight line or in a curved path with the path of motion maintained so that the light beam will cross the protuberances and recesses of the surface. This is shown in the accompanying diagram. Minute variations in the number and nature of the protuberances and recesses on the replica film cause corresponding variations in the intensity and angle of refraction of the light transmitted by the replica. The light passing through the restricting diaphragm strikes the photoelectric cell and produces a correspondingly varying current. The average voltage variation, measured by an a-c electronic voltmeter, is proportional to the variation, from increment to increment on the replica, of the amount of light allowed by the geometric form of each increment to reach the photoelectric cell. Meter readings or records are translated into roughness evaluations by calibrating against surfaces of known roughness as determined by microscopic means.

The salient features claimed by this method are: maintenance of a permanent record of a surface finish; rapid evaluation of a relatively large area of surface in one determination; simplicity of operation; prevention of damage to surface, even for soft materials such as lead or tin-base alloys; and availability of the method, since the replica may be prepared in one locality and transported to the location of the analyzer. There are indications that this method may also be applicable for evaluating the corrosion pitting of metals.

The NACA method uses a silver coating on the transparent film. This gives a positive replica which can be examined microscopically by viewing the opaque silver coating through the film. With this method, the surface of the specimen, first, must be thoroughly washed with petroleum ether, and then swabbed with acetone. A special stripping lacquer that peels easily from a metal



Schematic diagram of National Bureau of Standards' method of evaluating film replicas of surface finishes. A restricted beam of light is passed through an oscillating test replica, mounted on a vertical frame, and onto a photoelectric cell. The light transmitted varies in accordance with the geometric characteristics of the replica and causes a fluctuation of electron photoemission and hence a pulsating current, which is registered on the a-c voltmeter. Since the light transmitted by the replica is a function of the roughness of the surface, the surface may be evaluated through a calibration of the voltage readings. A rotating drum (lower) may be substituted for the vertically actuated frame to accommodate long replicas

Techniques

for Evaluating Engine Wear

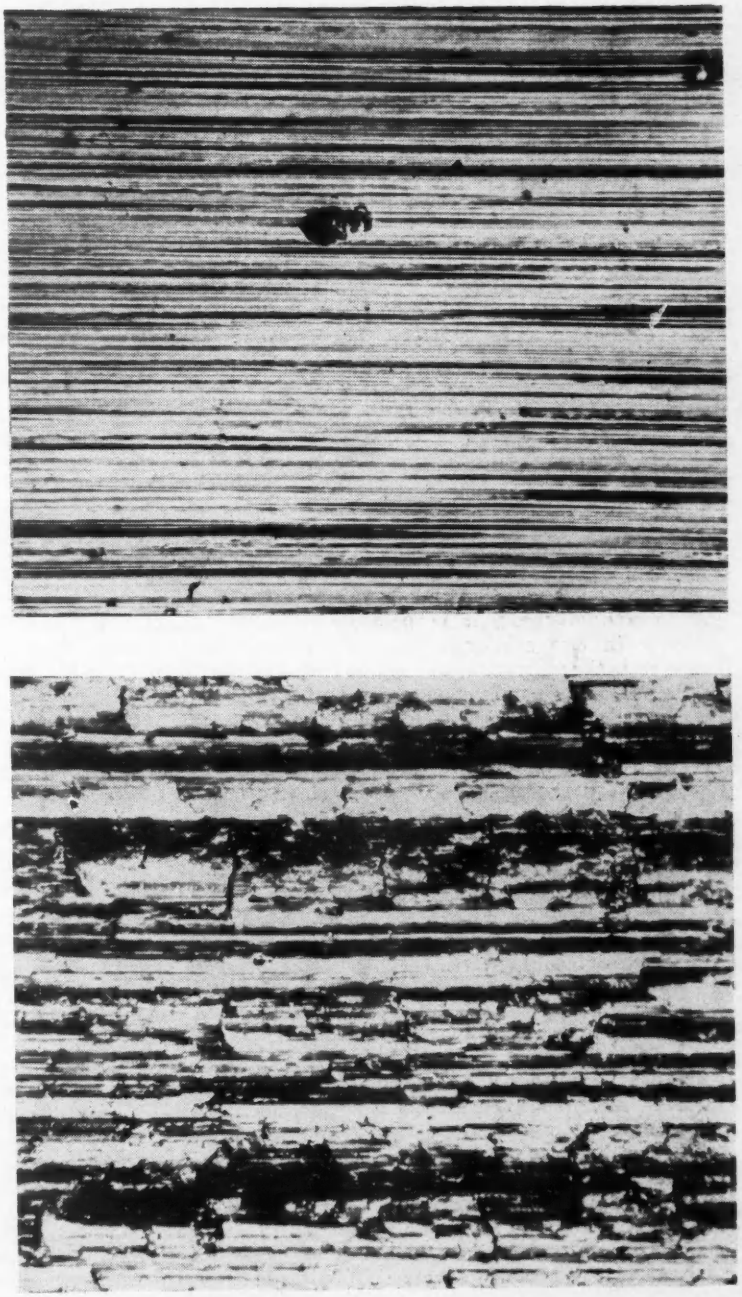
Surface Finishes Reproduced in Plastic Can Be Examined by Microscopic or Electronic Methods

surface is then spread in a thin layer over the surface of the specimen with a brush or a clean glass rod. Small specimens may be dipped in the lacquer and set on edge to drain. A stream of air may be directed over the lacquer-coated specimen for 15 min to hasten drying if the air velocity is kept low enough to prevent blushing and wrinkling of the film by the blast. The film is then stripped from the surface to remove any adhering foreign particles not removed by the washing. If the surface is porous or granular, it may be necessary to strip off more than one cleansing film to remove all the material lodged in the surface pores. These cleansing films are discarded.

The final negative replica film is spread on the specimen, and a gentle flow of air is directed across the lacquer film for at least 45 min before it is carefully peeled from the surface. If the replicas are dried in still air, cleansing films should be left on the specimen for at least one hour and the final replica film should be allowed to remain for at least four hours before being peeled from the surface. No reduction in shrinkage is gained by allowing the film to remain in place on the surface for a longer time. In general, a one per cent shrinkage should be taken into consideration in all replica studies.

The preparation of the positive replica consists essentially in plating a thin layer of silver on the replica side of the transparent negative lacquer replica. The dried

(*Turn to page* 78, *please*)



Micrographs of surfaces obtained by the use of plastic replicas at the National Bureau of Standards. Replicas of a finely ground surface (upper) and a coarse-shaped surface (lower) were photographed with transmitted light at a magnification of 100

Observations

by Joseph Geschelin

Final Assembly

FORD started a movement many years ago with the introduction of the Lincoln-Zephyr with its unit body-frame construction and the concept of final car assembly on a monorail assembly conveyor. A somewhat similar principle was employed with the introduction of the Nash 600. More recently the second final assembly line at Kaiser-Frazer was fitted with a monorail section and may be in service as this item goes to press. In view of these devlopments it is of interest to learn that a major assembly operation using the monorail system may be in operation sometime before the end of this year.

Submerged Arc Welds

WITHOUT the usual fanfare several leading parts plants have adopted the submerged arc welding technique for many basic operations. One important application is in the welding of propeller shaft joint ends to the tubing. While this is a natural, there are more dramatic uses. For example, if you have a part of large size or large diameter terminating in a stub shaft, it is possible to make it in two sections—one for the large end, the other for the small end. Each section is machined independently, then the two are joined by welding. One of the users tells us the submerged arc weld has greater penetration, freedom from porosity, greater strength, and a cleaner joint than welds made by more familiar methods. It is also said to be considerably faster. That's what the users tell us.

Wider Horizons

SINCE the end of the war the makers of precision castings—lost wax process as popularly termed—have been casting about for automotive applications. Those familiar with this process will realize that its most economic sphere is in the making of intricate parts which cannot be made any other way, or for parts made of metals difficult to machine, or in general for product designs difficult to translate into metal by conventional methods. Some of the producers, eager to expand their market, are seeking improvements and refinements in the basic technique so as to be in a better position competitively.

Induction Heating

WE LEARN from an authoritative source—a big user—that one of the prominent machine tool builders has developed a new type of induction heating machine said to provide a definite control of temperature of the work. We did not realize this was a problem until the new machine was drawn to our attention. As we are told, the trick is to measure the temperature of the work by suitable means and use the thermocouple reading as a signal to switch off the current when maximum conditions have been reached. At the time this item was written the machine had not been publicly announced.

Transfer Machines

SINCE the publication of the comprehensive article on the Buick cylinder block line, we have been told of several other applications of transfer lines. There may be others, of course, but we find there is a unique line in one of the Borg-Warner divisions and another at the Detroit Transmission plant. Neither is ready for announcement at the moment.

Directional Signals

WE HAVE just received a constructive recommendation relative to the item entitled "Turn Signals" which appeared in this column Feb. 15, 1947. Coming from a manufacturer supplying equipment for many makes of cars, it is well worth study by engineers and motor vehicle commissioners in the various States. The system in general use and therefore setting the current pattern has the following characteristics:

1. Four flashing lights, red on the rear and white in front, placed as nearly as possible to the corners of the car. The combination of positioning and flashing serves to distinguish them from other lights.
2. Semi-automatic control switch, mounted directly under the steering wheel, controlled by a lever which the driver moves in the direction of turn. It is turned off automatically, after the turn is completed, by the return rotation of the wheel. It can be turned off manually.
3. Two small pilot lights, located side by side on the instrument panel, in the driver's line of vision.
4. A special flasher unit to control the signal and pilot lights. If any of the signal lights fail to function the driver is warned by a change in cadence of the pilot lights.

It has been demonstrated that the flashing light is superior to the use of an arrow because the arrow becomes an indistinct blurr at night. It is claimed that this system conforms to present SAE recommendations and will meet the requirements of any of the States, if and when legislation is contemplated.

Seals for High Pressure

WE WERE shown a new type of high pressure seal recently which takes the place of a lock washer or locking means betwen the nut and fitting in a high pressure fluid line. It consists of a plain steel ring—electroplated—to which is bonded an inner washer of synthetic rubber. Feature of the latter is that it is wider on the inner diameter and thus is compressed when the fitting is made up. These seals are produced by a unique method to hold down cost and can be made in a wide range of diameters. Not yet in production but we can refer you to the prospective manufacturer.

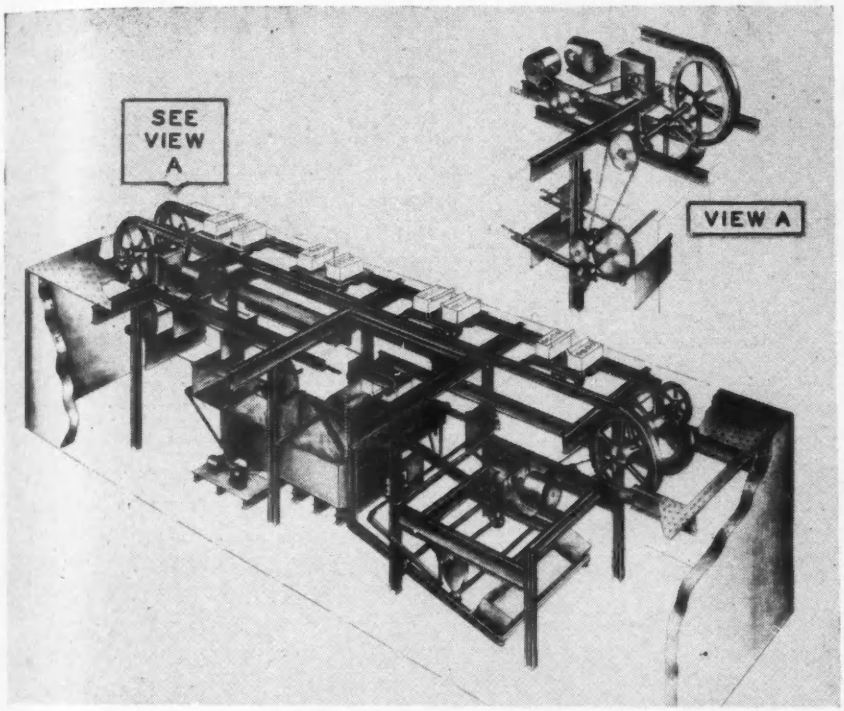
Unique Power Cylinder

THE makers of the Dowty liquid spring have developed a telescoping high unit pressure cylinder for operating dump bodies and other devices using power cylinders. Because of its telescoping construction this cylinder is shorter than is usual, hence requires less space in the chassis. It is smaller in diameter and is said to be about half the weight of a conventional cylinder. Moreover, the producer claims it is cheaper than competitive devices.

Infinitely Variable Transmission

PERSISTENT rumor around Detroit is that one of the large motor car producers has been working on the development of an infinitely variable transmission. We have no dope on the details but suspect it is some form of hydraulic drive and presumably not too expensive as automatic transmissions go.

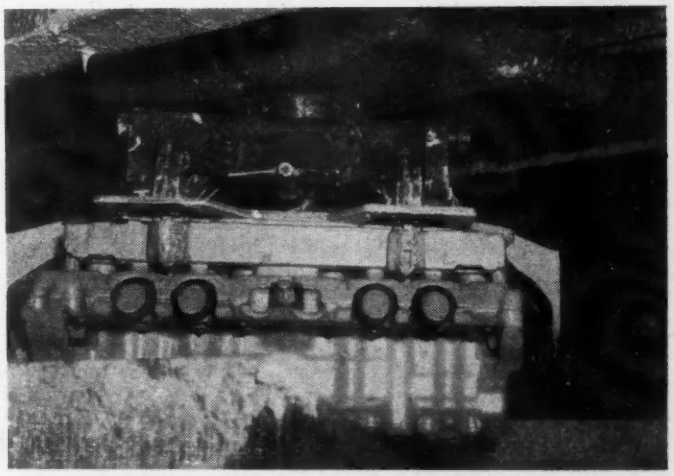
New Production Machine Automatically Coats Cylinder Block Cores



Shown at the left is a schematic drawing of Ford's new automatic core dipping and spinning machine. The conveyor carries the assembled cores through the dipping tank and as they emerge, a gear engages with a worm screw and spins the cores, thus removing excess coating compound

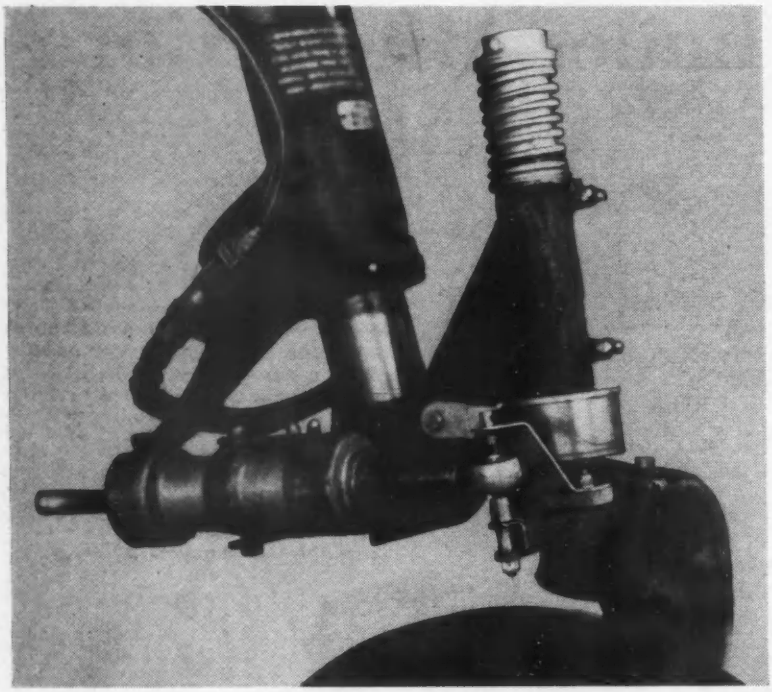
As shown below, the finished cores, after passing through the coating machine, are returned overhead in an upright position and unloaded

Now in use at Ford Motor Company's new three-million dollar core room is a production device which automatically coats V-8 cylinder blocks and cores with a protective material. The new machine, which is illustrated on this page, consists of a moving conveyor, dipping tank and spinning fixture. Sand cores, secured on the conveyor in pairs, are carried through the dipping tank containing the coating compound, and then spun to remove excess coating compound. As opposed to the former method of dipping, drying and assemblying by sections, the core is handled as a complete unit, thus eliminating the possibility of open spaces between the joined sections and reducing the likelihood of sand getting into the molten metal. The new core room is one unit of the $12 million foundry program Ford has under way.



In this photo a pair of cores mounted to the fixture is emerging from the sealing compound tank and next will go through the spinning operation. The new machine handles 250 pairs per hour

New Crosswind Landing



Details of the Fairchild castering mechanism are shown here.

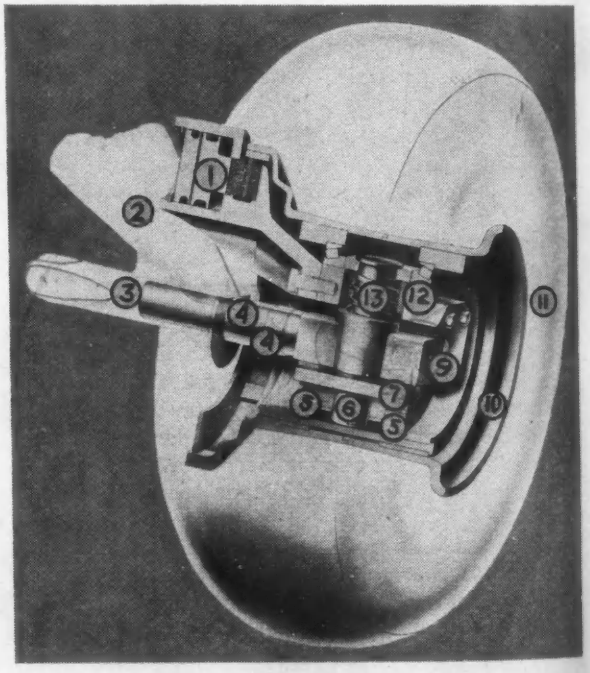
Airport authorities of the Civil Aeronautics Administration and the aviation industry believe that virtually all downtown landing facilities, on city waterfronts or elsewhere, should be one-runway strips, because of the enormous investment in high-value real estate, required by larger fields. The new experimental castering landing gears, now being developed through contracts let by CAA to aviation manufacturers, show promise of making possible safe and easy landings on one-runway airstrips at all times regardless of wind direction. Three manufacturers currently have such contracts: Goodyear Aircraft Corp., Fairchild Airplane & Engine Corp., and Firestone Tire & Rubber Co.

Basic principle of the castering type gears thus far developed is an arrange-

AN IMPORTANT new technical development for personal planes—the castering type landing gear for crosswind landings—promises to simplify to a considerable degree the problem of supplying close-in landing facilities for the private flyer. Three large lakefront cities, Milwaukee, Chicago and Cleveland now have or are constructing one-runway airstrips on their lakefronts close to the downtown business districts, primarily for the convenience of itinerant air travelers.

But up until now, such airstrips have had a serious limiting factor—the difficulty and actual hazard involved in landing on a single runway field when a wind of any considerable velocity angles across the runway. Regulations prescribed for operation of the new Northerly Island airstrip on Chicago's lakefront, when that strip is opened next summer, are an indication of this limit:

"The airport shall be closed . . . if the direction of the wind is more than 67½ degrees from the direction of the runway and of a velocity greater than 10 mph, or more than 45 degrees . . . and of a velocity greater than 15 mph, or more than 22½ degrees . . . and of a velocity greater than 20 mph, or from any direction if wind is of sufficient velocity to make landing and takeoff hazardous."



Sectional drawing of Goodyear's crosswind landing gear wheel. Parts numbered as follows:

1 Goodyear single disc brake
2 Vee strut
3 Axle
4 Attaching bolts
5 Roller bearings
6 King pin
7 Compensating cam
8 Compensating cam follower
9 Shimmy damper brake
10 Wheel
11 Tire
12 Castering hub
13 Return spring

Gears of Caster Type

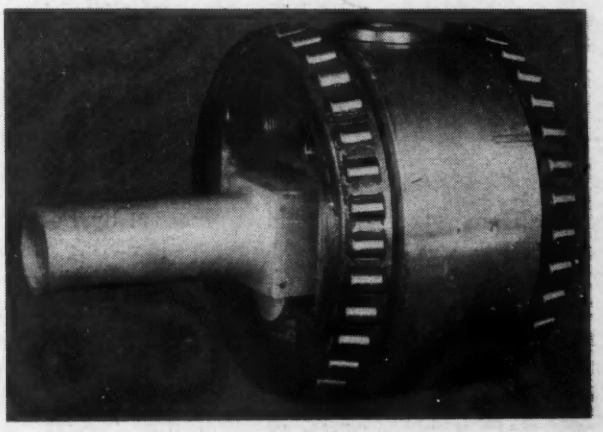
Developed for Personal Planes

By Alec Walker

ment which permits the main landing gear wheels to swivel 25 degrees either side of center, when the plane travels over the ground in taxiing, takeoff or landing. This enables the castering wheel to follow the line of force in a landing or takeoff, regardless of the heading of the airplane, which will be "crabbed" into the crosswind, at an angle from the runway heading.

Most promising of the developments sponsored by CAA is the Goodyear castering airwheel which places the entire castering mechanism inside the wheel itself. This makes it possible to modify any conventional lightplane of the Piper Cub variety or larger, by removing the tip of the axle and substituting the castering wheel for the conventional aircraft wheel.

Art Chapman, Goodyear test pilot, has flown a Piper J-3 Cub Trainer, standard except for the castering wheel installation, in repeated landings and takeoffs in crosswinds as high as 30 mph without difficulty. He demonstrated the gear recently at Chicago in a 10 mph crosswind, making at least 20 takeoffs and landings on a single runway, landing each time in the opposite direction from his takeoffs. A number of CAA officials, and newspaper and magazine writers who witnessed the demonstration made short flights themselves with Chapman, for first-hand experience of the unusual landing and takeoff procedure. The



The Goodyear castering assembly is contained within this hub.

gear demonstarted was a prototype article. Goodyear plans to re-engineer it for quantity production and it may appear on the market late in 1947.

O. W. Loudenslager, engineer in charge of the project, and Dr. Karl Arnstein, vice-president, engineering, Goodyear Aircraft, expect that neither weight nor cost of the castering device will be a serious deterrent to its use on even the smallest and lowest priced lightplanes. They anticipate that quantity production of the castering wheel will make possible its inclusion on many new airplanes as original equip-

This landing view of Goodyear's Aircraft's crosswind landing gear clearly illustrqtes the 25-degree caster when wheels strike the runway in the "crab" attitude necessary for a straight approach when wind is across the runway heading.

ment, and that many planes now in service will be modified to use it.

The wheel pivots on a kingpin inside the hub, which is angled 30 degrees with the ground, so that the point of contact of the wheel with the ground will always trail the axis of the kingpin, regardless of whether the airplane tail is raised to level flight position, or is down in three-point position.

The kingpin is surrounded by a stationary compensating cam. A cam follower rides in the cam at the base of the kingpin and is attached to the airplane axle. The cam arrangement raises the airplane slightly when the wheel pivots, thus correcting a drop in the airplane's center of gravity. The cam arrangement also returns the wheel to normal centered position when the airplane becomes airborne. It is designed to overcorrect, slightly, as an additional safeguard. A spring-loaded brake is attached to the axle to dampen shimmy, and a coil spring at the top of the kingpin helps provide necessary vibration dampening.

First of the CAA-sponsored castering landing gears to be flown successfully was engineered by Fairchild, and test flown on a Fairchild PT-19 low-wing trainer. The Fairchild gear has the castering arrangement in the landing gear leg instead of in the wheel. Result is a more complex installation which weighs 30 lb more than the normal gear of the PT-19. A cam is used similarly to correct for center of gravity drop and return the wheel to center position after takeoff. And a large cylinder above the wheel fork and in front of the landing gear leg, dampens shimmy. The Fairchild plane and gear, now at the CAA hangar at Washington National Airport, already have been testflown for a large number of hours, by many CAA pilots and others, under widely varying conditions, with uniformly favorable pilot comment.

The third CAA project by Firestone is still in an early stage. It is expected that Firestone will adapt the castering principle to a tricycle landing gear with all three wheels castering, and to use the gear on an Ercoupe in test flights. Firestone now manufactures a "Superflex" landing gear for lightplanes which uses a rubber shock absorption principle. It is planned to adapt this gear to the castering wheel system. The Firestone castering gear has not yet been test-flown.

A fourth, an independent castering wheel arrangement, is the novel nosewheel developed by Waco Airplane Co. for its new personal four-place plane, the Waco Aristocraft, which recently began its first test flights. The Waco nosewheel has the advantage of being either free-castering or steerable at the option of the pilot, and is the first retractable castering wheel developed in this country.

When the Waco nosewheel is retracted after takeoff, it automatically becomes free castering, and continues to caster when extended for a landing. This condition continues until the pilot operates a cockpit control which makes the nosewheel steerable, thus giving the pilot the advantages of a steerable wheel for ground taxiing and normal landings, and takeoffs, into the wind, while he may also have the advantages of a castering nosewheel for crosswind takeoffs and landings.

All four of the American crosswind castering gears are antedated by the British McLarren swivel landing gear, which was flown successfully about 1943, but never placed in mass production. This gear required pilot adjustment for each takeoff, after a wind-drift reading had been taken on the runway heading. CAA engineers expect that the automatic feature of the American castering gear, not requiring pilot attention, will be a major factor in public acceptance.

Castering nosewheel installed on the Waco Aristocraft.

The three CAA-sponsored developments were initiated by John H. Geisse, as assistant to CAA Administrator T. P. Wright, for personal flying development. Geisse has since resigned, but is continuing as a part-time consultant on this project. Lloyd Child, former Curtiss-Wright chief test pilot, and successor to Geisse as personal flying assistant to the administrator, is also active in the project and has done much of the test and demonstration flying.

For the entire development, Congress allocated $165,000 to CAA. It is expected that sufficient funds will remain for a fourth development contract, a castering gear for a twin-engined Beechcraft Model 18. This is planned largely as a demonstration of the practicality of the castering gear on a larger twin-engined plane with retractable landing gear, since CAA sponsors are confident that the gear may be used on any type and size plane successfully. At least one airline, United Air Lines, has shown an interest in possible application of the gear to transport planes.

All the CAA-sponsored developments when completed will be made available by the federal agency to the aircraft industry, with complete data and drawings, so that any manufacturer desiring to make such a gear will have the technical data necessary to do so.

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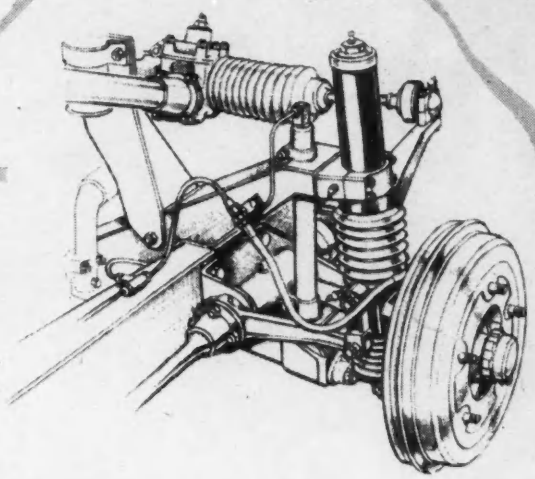
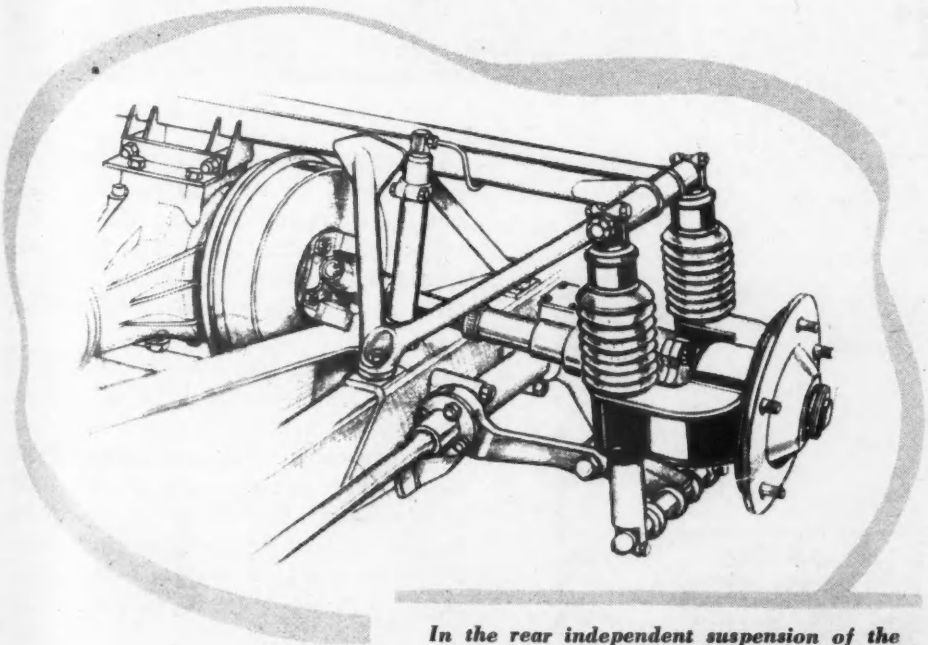
New Wheel Suspension Design



Details of the front independent suspension of the 1947 Invicta (Drawing from The Autocar, *London).*

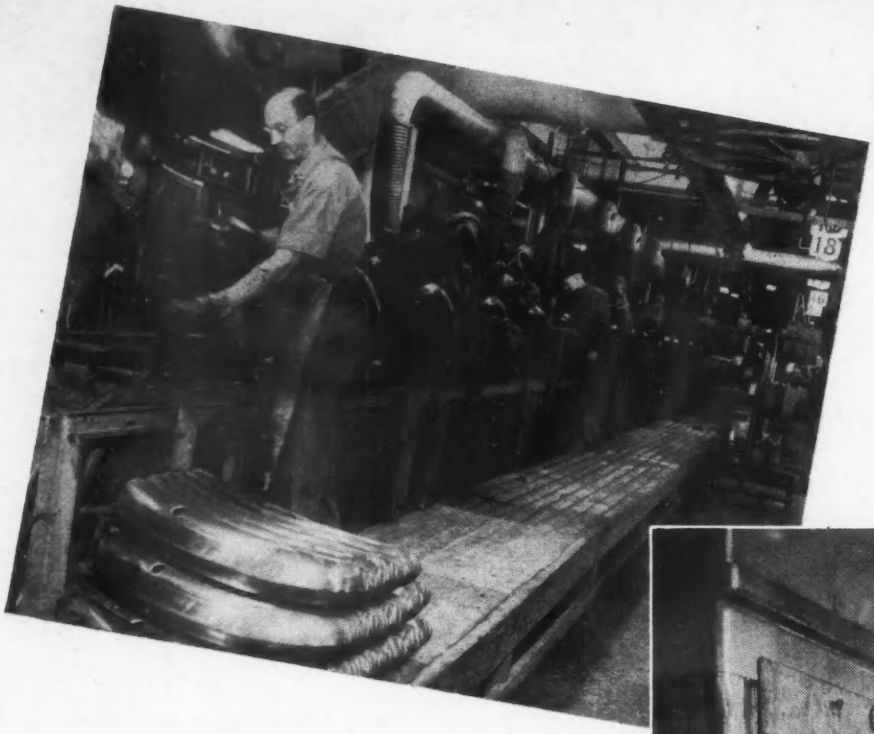
A NOVEL arrangement of torsion bars, hydraulic dampers, and independent wheel suspension for both front and rear wheels is incorporated in the 1947 model of the British Invicta passenger car. The front wheels are so mounted that they travel up and down an almost vertical guide, maintaining a constant angle to the road so that there is no increase or decrease of wheelbase or tread. At the lower end the wheel assembly is connected through a link to a wishbone bracket and a torsion bar, the link being necessary because the wishbone bracket swings on an arc, while the assembly has a vertical movement. The torsion bar is carried along the side of the frame to a point at about its center, and an extension of the torsion bar operates the hydraulic damper through a coupling which makes alignment easier.

The chief point in the suspension design is that the steering arm does not slide with the wheel assembly, being mounted on a spline which allows it to remain in position vertically, while the assembly moves, the idea being to eliminate the usual swing of the tie rod. Thus the rack and pinion steering can be mounted rigidly on the frame, the rack operating each section of the tie rod which is bolted to the corresponding steering arm and has no other work to do than to steer.



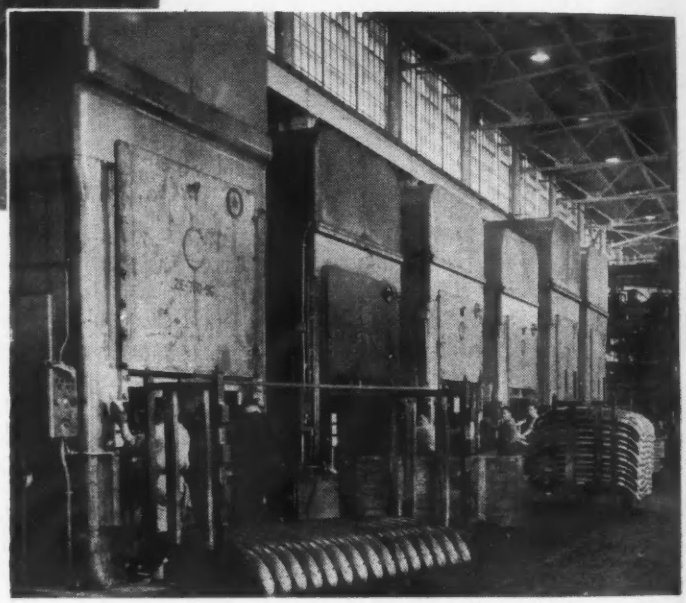
In the rear independent suspension of the Invicta, the wheel assembly moves on swinging guide bars against a torsion bar. An interesting feature in this arrangement is the location of the brake drums which are mounted on both sides of the housing for the final drive, thus eliminating that unsprung weight on the wheels. (Drawing from The Autocar, *London.)*

At the rear end, the suspension arrangement is different. The wheel assembly still slides on guides against the torsion bar and hydraulic damper, but as the wishbone brackets move, the guides for the wheel assembly swing outwards slightly, pivoting on a bearing, and the exposed propeller-shafts have a sliding joint to take the increase and decrease of length as the wheels travel up or down.



(Left) This is a view of one of parallel rows of automatic buffing machines working on bumper sections in the plating plant at Oldsmobile.

(Below) Oldsmobile bumpers are cold-drawn in this battery of heavy presses in the Press Metal Plant. Single piece rear bumpers are shown here for 1947 Series "60" cars. Three-piece bumpers for the front are made on the same presses with a change of dies.



Improved Methods Produce

80 Bumper Sets per Hour

TO ASSURE an uninterrupted supply of bumpers for its 1947 cars, the Oldsmobile Division, General Motors Corporation, Lansing, Mich., now has a self-contained bumper department set up with an immediate goal of 80 sets per hour.

Bumper stampings are produced in one section of the enormous sheet metal plant on a battery of six new presses. We find here a variation from conventional practice in that stampings are made by cold deep drawing instead of by processing heated blanks. Except those used on the Series 66, the bumpers are assembled of

(*Turn to page* 64, *please*)

A close-up of the trimming operation on the tip of the Series "60" rear bumper in a 350-ton press at Oldsmobile. The trim operation on the bumper to the left is to be completed while the initial trim will take place on the bumper to the right.

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE *and* AVIATION INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

A-90—Heat Treating Fixtures for Pit-Type Furnaces

Driver-Harris Co.—A new 24-page bulletin, No. F-46, describes and illustrates heat-treating fixtures for pit-type furnaces. A large number of fixtures designed for specific heat-treating purposes in conjunction with this type of furnace are shown, accompanied by a short description of the fixture and its special application. The purpose of the bulletin is to provide possible solutions to pit-type furnace loading problems, etc. The last page of the bulletin includes a handy list of all Driver-Harris heat and corrosion-resistant and electrical resistance alloys.

A-91—Milling With Carbides

Metal Cutting Tool Institute, Milling Cutter Div.—A 44-page Technical Report, Milling With Carbides, contains information on the various phases of the subject under the following headings: general considerations in applying carbides to milling; grades of carbides and their application to milling; nomenclature for carbide milling cutters; machine tools and fixtures for carbide milling; carbide milling cutter design; operating techniques for carbide milling and sharpening and care of carbide milling cutters. Copies of the report may be had by writing the Metal Cutting Tool Institute, 6400 Chrysler Building, New York 17. Single copies are $1.00 each.

A-92—Dust Control

American Air Filter Co., Inc.—A new 19-page illustrated booklet covering the company's Type D Roto-Clone dynamic precipitator has been issued. Among the illustrations are detailed views of Wear Liners, Radiation Shield, Skimmer Precleaners, Aftercleaners, Rotary Lock, Trickle Valves and Models E & F Self-contained units, together with capacity and dimension table for each size.

A-93—Precision Lathes

South Bend Lathe Works—Catalog No. 13-F illustrates in color and describes the 13-in. swing South Bend Quick Change Gear and Toolroom Lathes. Attachments and accessories are also shown.

A-94—E-Z Cut Plates

Joseph T. Ryerson & Son, Inc.—8-page bulletin illustrates and describes a special type of high manganese high sulphur analysis steel plate developed especially for applications involving machining such as the production of rubber molds, machine parts, die bases, jigs, fixtures, etc. Included in the bulletin are analysis, physicals and explanation of machining advantages; how to weld and properties developed by case carburizing.

A-95—Hydraulic Clamp Unit

John S. Barnes Corp.—Bulletin 305-U describes and illustrates the new hydraulic unit, the Rapidraulic Junior. In addition to the description and illustrations, specifications and installation data are included.

A-96—Heat Exchangers

National Carbon Co., Inc.—Catalog Section M8808 describes standard, seven tube heat exchangers of Karbate Impervious Graphite for use under highly corrosive conditions.

A-97—Blueprinting Machines

The C. F. Pease Co.—New general catalog contains information on the company's line of blueprinting machines and accessories, whiteprinting machines and accessories, sensitized papers and cloths, drafting room furniture and photographic arc lamps. Clear illustrations, including full-view, cutaway and close-up illustrations, as well as diagrams are included. Pages are devoted to descriptions of applications and detailed information regarding measurements and weights of equipment. The book contains 238 pages, is divided into seven sections and is completely indexed.

(*Turn to page 67, please*)

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NEW Production and Plant EQUIPMENT

B-1—Machine Checks Piston Dimensions

Inspections of numerous critical dimensions of automotive pistons as well as eight classifications are combined into one quick operation on the "Airlectric Multichek" developed by the Sheffield Corp., 721 Springfield Ave., Dayton 1, Ohio.

The operator merely loads and unloads the parts. Accuracy of check is independent of the human element. Segregation into classifications is made possible by color stamping during the gaging cycle. The rate of inspection and selection is between 500 and 700 pistons per hour, according to the efficiency of the operator.

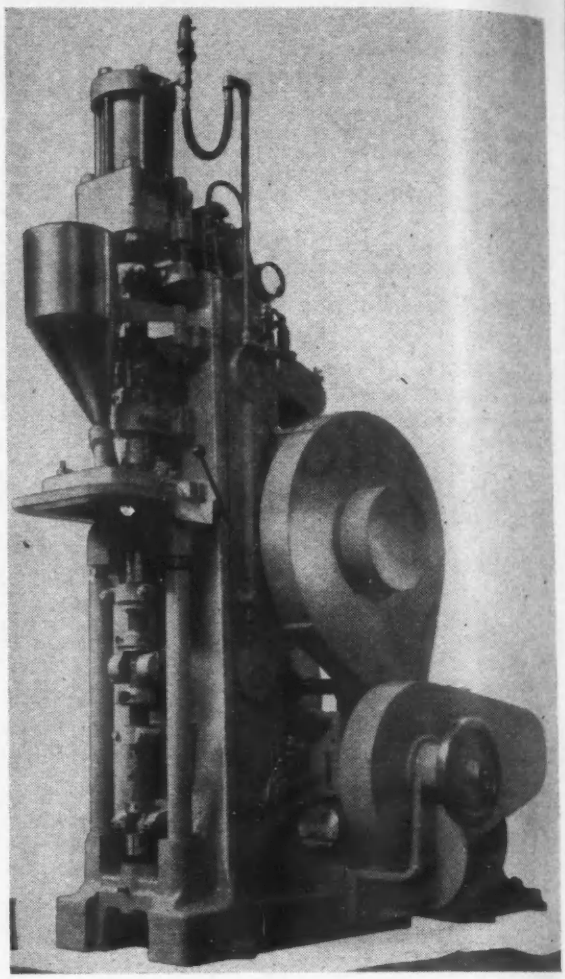
Pistons with undersize pin holes will not enter gaging position, and so are rejected at the start of the gaging operation. When the piston is in gaging position, simultaneous check is made of average diameter of pin holes at each of two bearings, diameters of four ring grooves, widths of five ring grooves and diameter of bottom skirt.

In addition, three classifications of pistons are automatically made on the basis of the average diameter of the pin hole, selections being made in steps of .0001 in. between minimum and maximum tolerance limits. Check and classification of the pin holes is made by an air spindle and "Airlectric" head, which also actuates a series of three color stamping devices. Further classification is made by five different selections in .0001-in. steps on the bottom skirt diameter by an "Airsnap" and "Airlectric" head, which also operates a series of five color stamping devices.

"Electrichek" heads are used for checking the diameter of the four ring grooves. Ring groove widths are checked with "Go" and "No Go" gaging members, which actuate micro-switches. Each dimension has its own set of red and green signal lights to show respectively undersize and oversize. In addition, all individual dimension circuits are integrated into one master light circuit. A separate set of signal lights on the right of the light panel facilitates setting the "Multichek" with the masters. A bell rings when all dimensions are within specified tolerance limits.

B-2—Press for Powdered Metal Parts

This 40-ton capacity cam-type press has been designed and built by the F. J. Stokes Machine Co., Philadelphia, for high production in compacting powdered metals parts. Known as the "S-3", it will operate up to 30 strokes per minute. This press is a fully automatic, cam operated machine in which independent cams control the synchronized movements of both upper and lower punches. It is equipped with a compound lower punch designed to operate either as a secondary lower punch or as a movable core rod. If desired, this mechanism can be locked in place to serve as a stationary core rod. The die table can take the full pressure applied by the upper punch, which is useful in the manufacture of shouldered bushings or similar pieces



Sheffield Airlectric multicheck that checks automotive pistons at the rate of 500 to 700 per hour

B-3—Double-Spindle Wet Grinder

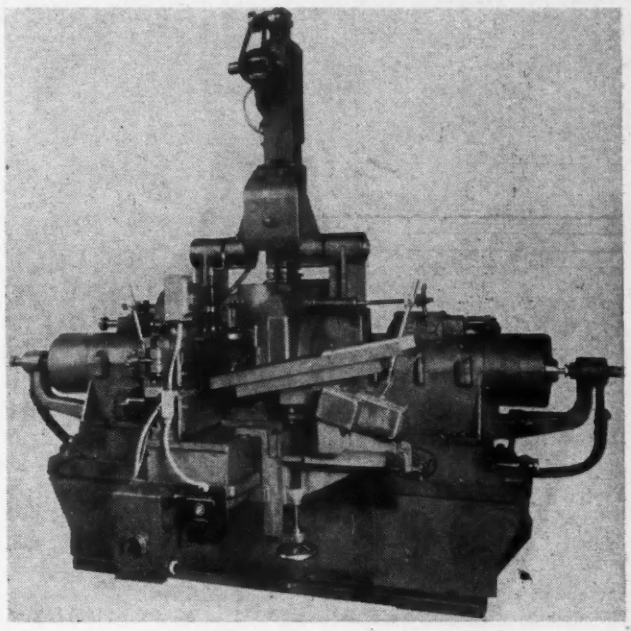
Charles H. Besly and Co., Chicago, Ill., recently introduced a new-type double-spindle wet grinder designed for grinding double end drop forged engineers' wrenches and many other parts

New Production and Plant EQUIPMENT

that require grinding of parallel surfaces.

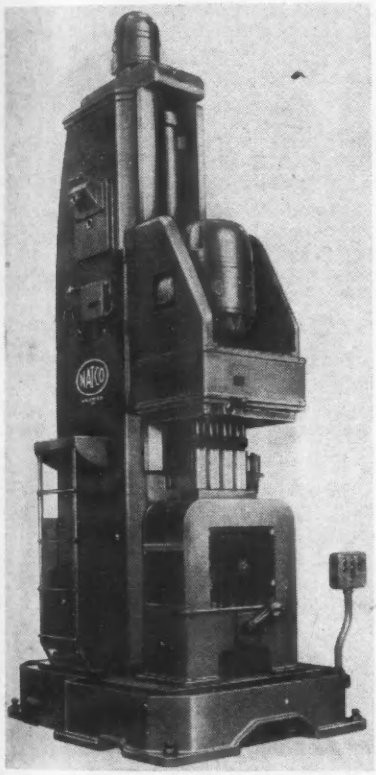
Listed as No. 226, the new 30-in. grinder features a combination magnetic vibrator and automatic chain feed especially arranged for speedy and accurate feeding of the wrenches through the grinder. Using oil as a coolant, the new grinder is capable of turning out 2400 wrenches per hour, measuring eight in. overall and ground on all four surfaces.

In order to reach this 600-per-hour production figure it was necessary to forego opening and closing the wheels. As a result the ring type grinding wheels quickly developed taper and this taper was reproduced on the wrench faces. By the new method the wrenches are guided straight through the grinder and grinding wheel wear is evenly distributed. Thus the wrenches emerge from the grinder flat parallel and very close to a given thickness. This facilitates subsequent polishing operations.



Besly No. 226 double-spindle wet grinder

B-4—Vertical Machine for Cylinder Boring



National Automatic Tool Co., Inc., Richmond, Ind., has developed this new vertical machine for cylinder boring of replaceable sleeve liners. It is arranged with hydraulic feed and a fixed center gear driven head containing four spindles. The part worked on in this application is a cylinder and crankcase of cast iron, and the production rate is 28 parts per hour. This Natco Holesteel machine is arranged to combination rough and finish bore four cylinder bores to 3.781 in. diameter and counterbore to 4.001 in. diameter. The machine utilizes a jump feed to combination rough and finish bore lower holes to 3.719 in. diameter and chamfer 15 deg. by ¼ in. deep

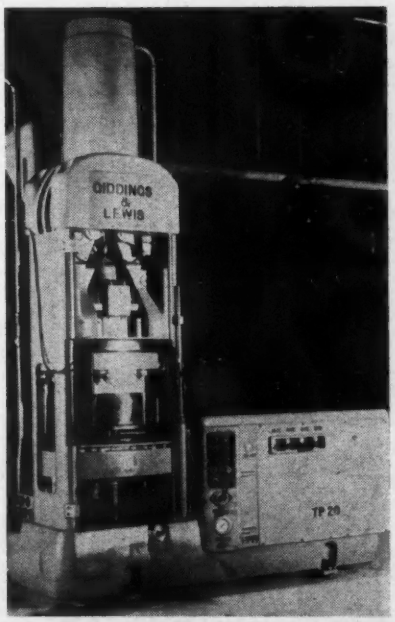
B-5—Plastics Injection Press

Vertical construction incorporating the use of a single hydraulic cylinder characterizes the new G. & L. vertical plastics injection press, manufactured by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This arrangement provides for clamping the mold halves together and injecting the plastic material into the mold cavity in the same stroke of the piston rod. The piston is hydraulically powered by a self-contained hydraulic unit which forms an integral part of the machine. When the cylinder is activated the piston rod movement operates a toggle mechanism. This initial downward movement of the piston rod locks the die plates together. As the piston rod continues its downward movement, it also serves as a plunger to inject thermoplastic material into the mold.

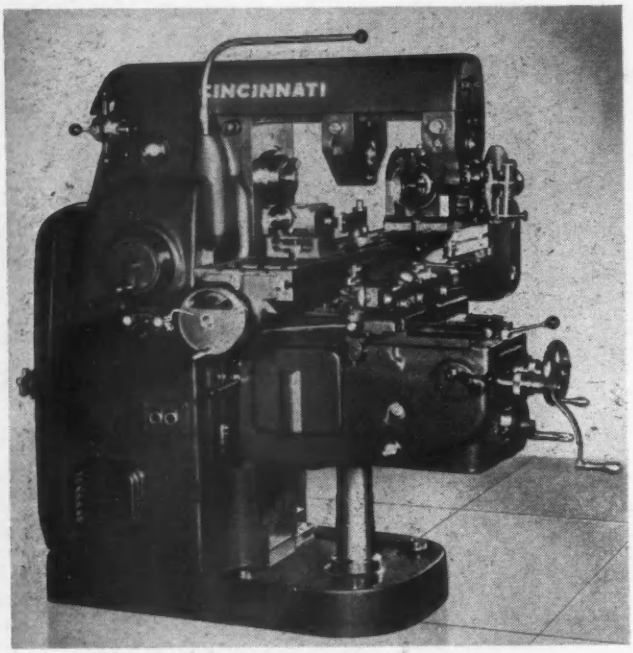
G. & L. vertical machine design provides for simplified quick changing of heating cylinders. Through easy accessibility, change-over is said to be approximately 20 minutes. This quick change feature makes it practical to have a supply of heating cylinders for different plastic materials and colors.

B-6—Plain and Universal Millers

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, has announced a new addition to its line of knee-and-column type milling machines. Designated the No. 2 ML., it is offered in plain and universal styles as a companion machine to the No. 2 MI. Driven



G. & L. plastics injection press



Cincinnati No. 2 ML milling machine

by a three-hp motor, it is about 1000 lb lighter than the other model.

General appearance of the No. 2 ML corresponds very closely to the No. 2 MI, and features are identical. The machine has exceptionally wide speed and feed ratios—60 to 1 and 120 to 1, respectively. There are 16 spindle speeds, ranging from 25 to 1500 rpm, changed with a single crank type control at the side of the column.

Feed rates are changed in the same manner as the speeds—one-half turn of a single crank type control, throughout the complete range of 16 feeds, from ¼ in. to 30 in. per minute.

The motor is mounted on a cradle type support, which can be removed as a unit from the machine by removing four bolts. This construction also serves as a belt adjustment.

Feed controls are independent of each other, and each feed lever has a forward, neutral and reverse position. All are equipped with plastic knobs. Cross and vertical hand cranks are automatically disengaged when their respective power feed lever is engaged.

The main drive clutch, brake, and all spindle drive gearing up to the gear shaft are contained in a unit bolted to the rear wall of the column. As in other Cincinnati Milling Machines, the entire spindle drive is anti-friction mounted.

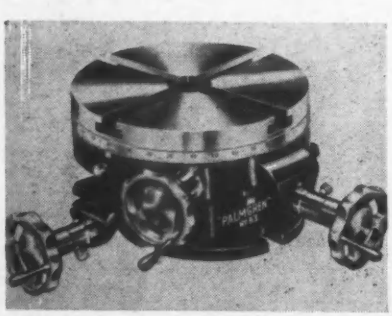
Many attachments are available. These include circular milling tables, several types of vertical and universal spindle attachments, motorized overarm, etc.

B-7—Indexing Table with Cross Feed

An indexing table with 360 deg rotary movement and four-in. cross feed travel was recently brought out by Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill. Known as the Palmgren No. 83, it has a circular table eight in. in diameter with a ⅝-in. by 1⅛-in. "T" slot. The table is graduated for the full 360 deg by single degrees in right-angle segments. An adjusting screw permits setting to any position.

The four-in. cross-feed movement, which provides a two-in. travel each way from center, is controlled by another accurately graduated screw that permits infinite adjustment within the travel range. All graduation markings are clearly cut into the material for easy reading.

The base has four bolt and key slots for mounting of the table to a milling machine, drill press, shaper, or surface grinder.



Palmgren No. 83 indexing table

B-8—Karbate Heat Exchangers

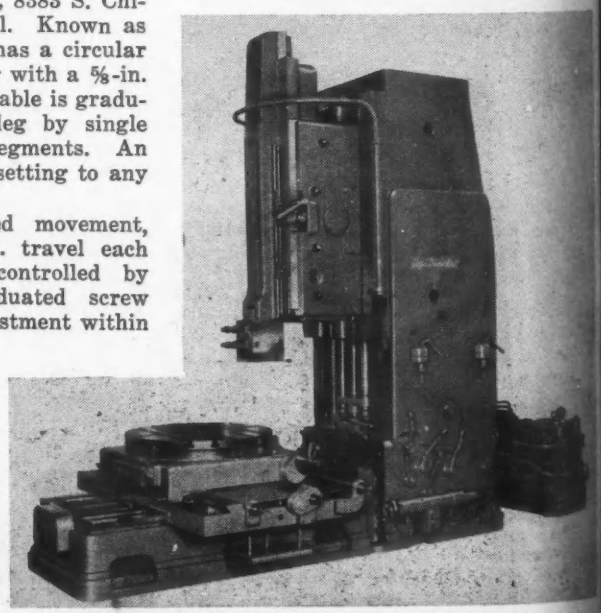
Seven tube "Karbate" impervious graphite shell and tube heat exchangers for use under highly corrosive conditions are now available from National Carbon Co., Inc., 30 E. 42 St., New York 17, N. Y., in three standard sizes of 4 ft 3 in., 7 ft 3 in. and 10 ft. 3 in. in length. All three units employ 1 in. ID by 1½ in. OD "Karbate" tubes in bundles encased in standard 6 in. ID steel pipe shells. The exchangers are identical in every respect except for pipe length and the number of "Karbate" baffles, and all tube bundles and shells of the same size are interchangeable.

The units can be employed as heaters, coolers, boilers or condensers, and can be operated vertically or horizontally. They will carry temperatures up to 338 F. and a working pressure of 50 psi on both the tube and shell sides. Standard nozzle connections permit ready installation with piping connections of almost any material of construction. Water, brine or steam are suitable on the shell side.

B-9—Large Size Hy-Draulic Slotters

Two large size Hy-Draulic slotters are now being produced by the Rockford Machine Tool Co., Rockford, Ill. These machines are the new 48-in. stroke slotter and the improved 36-in. stroke slotter. Massive column design is said to provide rigidity for the heaviest duty work. Ram may be set for

(*Turn to page* 86, *please*)



Rockford Hy-Draulic slotter

Studying the Future of Your Steel

As white hot steel is teemed into ingots, the Inland inspector with his optical pyrometer takes a temperature reading . . . an important step in the quality control of your steel. Close inspection at this stage of production helps to assure the quality of the finished product. And every other step in steelmaking—from Mesabi ore to finished product—is closely supervised by Inland's experienced personnel.

And we also want you to know that we are keenly conscious of the unfilled needs for steel and are increasing production and expanding facilities as fast as materials and equipment are available.

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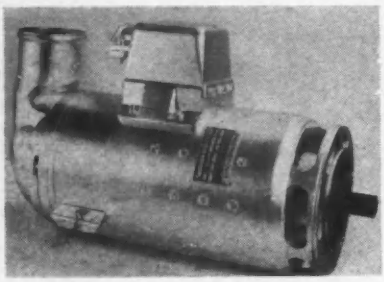
NEW Products for AIRCRAFT

C-1—New Generator and Protective Relay

Two new products have recently been announced by Westinghouse Electric Corp., Pittsburgh, Pa.

A 300-amp, 30-volt d-c generator that operates satisfactorily over a speed range of 3000 to 9000 rpm has been designed and built to meet the requirements of high performance commercial aircraft. It weighs 58 lb.

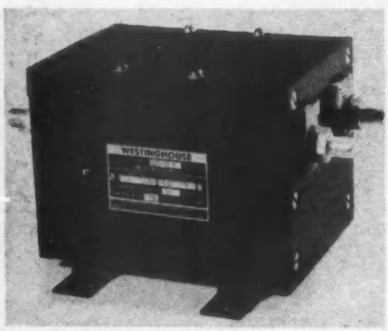
The generator is compensated with both interpole and pole face windings that are said to make possible exceptional overload capacity and commutation properties. Altitude treated



Westinghouse generator

brushes are used and a new quick-disconnect mounting flange facilitates installation. The frame is 6½ in. in diameter and the overall length is 14 17/32 in.

A main generator contactor and ground protective relay assembly for aircraft d-c power system applications also is available from Westinghouse. The assembly is enclosed in a box pro-



Westinghouse main generator contactor

viding dust, moisture and explosion resistant features. It weighs 3.5 lb.

Bridge-type double break contacts and a special inertia spring arrangement are said to assure freedom from arcing or freezing contacts. A low voltage drop-out feature prevents malfunctioning at below normal system voltages. The ground protection relay detects faults in the generator or generator leads and clears the system before damage occurs.

The box can be mounted in any position in or near the engine nacelle. Four main terminals and three control terminals are provided. The positive and negative generator leads pass through the assembly. The control circuits include the main contactor operating coil and the contacts of the protective relay.

C-2—Transparent Acetate Navigation Tape

A transparent acetate tape that is applied easily to aeronautical charts for course plotting has been developed by the Grimes Manufacturing Co., Urbana, Ohio. The tape includes a line down the center to show the pilot's course. Cross-lines and numbers indicate the miles flown from the starting point and in reverse for the return trip.

The half-inch wide tape eliminates the use of a straight edge and scale to plot a course. All necessary information is given by the tape, which is available in two types. Tape for sectional charts has a scale of 1 to 500,000 and tape for world charts has a scale of 1 to 1,000,000.

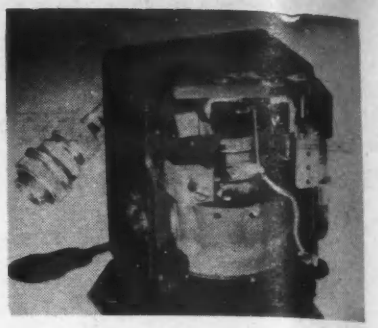
Once applied, the Grimes navigation tape is not removable. It adheres to the chart and is not obliterated for future use. Many courses may be plotted on the same chart.

C-3—Precision D-C Rate Gyro

Fairchild Camera and Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y., offers a precision d-c rate gyro, which was originallly developed for wartime computing gunsights.

The unit is an angular rate-measuring device for application where accurate measurement for control purposes is required. Such applications include stabilization systems, speed control for large power factory machines such as turret lathes, computing systems and certain types of angular velocity indicators and accelerometers.

Special features of the Fairchild rate gyro include take-off element of the a-c reluctance type operating at 115 volts, 400 cycles, with an output sensitivity of 0.49 volts per angular deg per sec, and a motor element of the d-c governor-controlled, shunt type, operating on a



Fairchild rate gyro

voltage range of 24 to 32 d-c. Motor speed is governor-controlled to plus or minus one per cent over the ambient temperature range of −65 F to 160 F, in order to maintain accuracy of precesssion. Operating input currents are low: the d-c being 0.3 amp, and the a-c being 0.02 amp.

The gyro precession is limited to one plane of freedom and is restrained by a balanced rate spring system. Undue oscillations are damped through a permanent magnet eddy-current unit.

C-4—Leakage Gage

The Cities Service leakage gage, a product of Hillside Laboratories, 226 Highway 29, Hillside, N. J., is equipped with a quick-connecting air supply hose fitting and a 10-ft length of hose. The hose terminates in a trigger-operated expanding fitting for rapid attachment o a spark plug hole of the cylinder to be tested. A built-in valve regulates pressure.

In use the leakage gage is connected to an air supply of not less than 80 psi,

(*Turn to page 76, please*)

C-5—Rebat Aircraft Battery

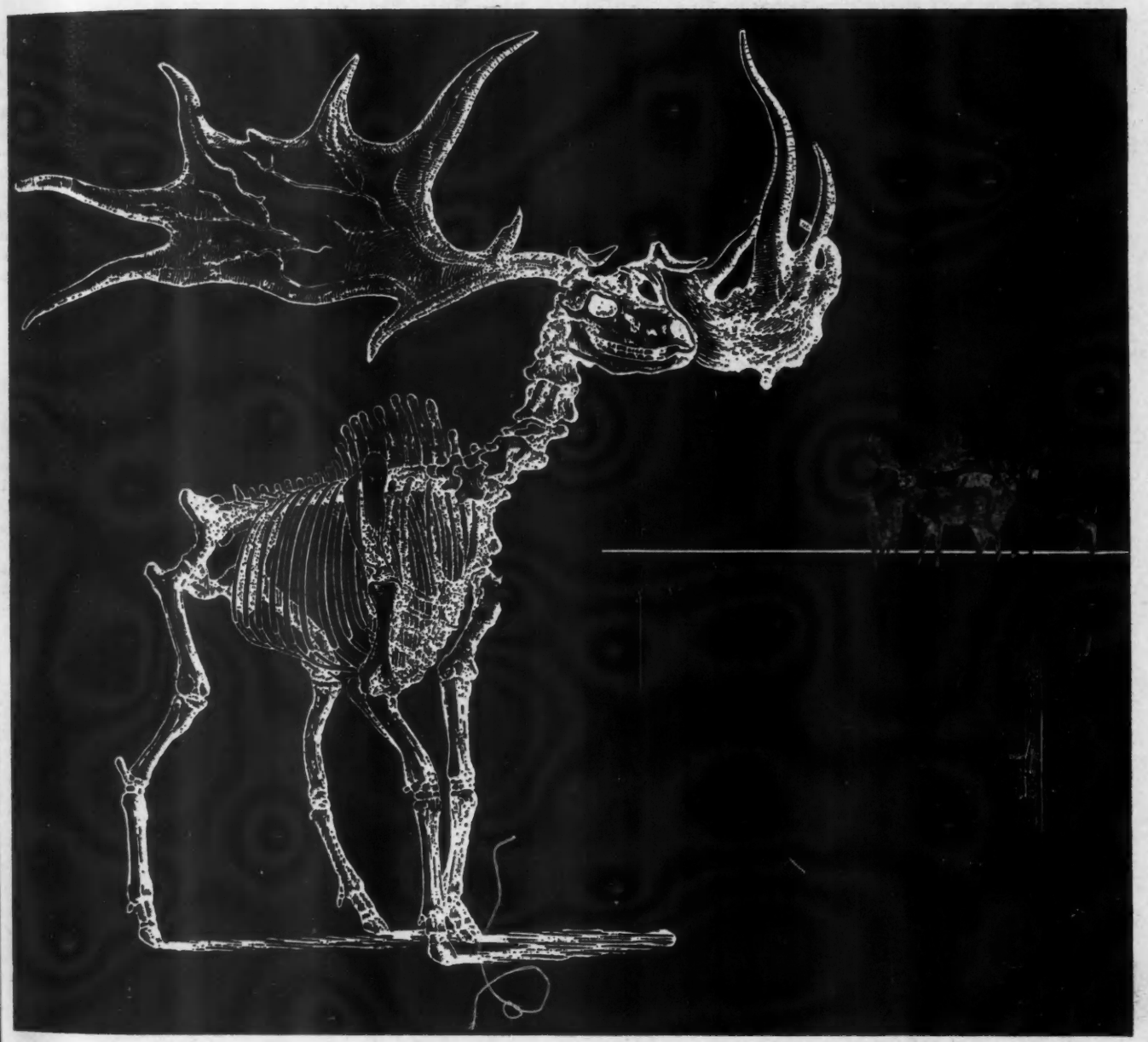
Weighing 21½ lb. and measuring 7¾ in. by 5¼ in. by 7⅞ in. overall, the new S 24 Rebat aircraft battery recently introduced by Reading Batteries, Inc., Reading, Pa., is said to be the smallest and most compact storage battery available with 24 ampere hour capacity. While the S 24 Rebat was specifically designed for light aircraft it should find use wherever weight and space savings are all-important factors

THE ELK THAT ALSO RAN

Once upon a time an enormous elk with out-size antlers roamed the Irish forests. He was impressive but impractical; concentration of weight in the wrong place ruined his ability to meet competition.

The same thing can happen in modern machinery. Too much weight, especially in parts subject to rapid operation, can reduce efficiency considerably. The machine may not become extinct, but it won't make many friends.

There is a simple, economical way of avoiding such troubles—specifying molybdenum steels. Their hardenability permits weight reduction with no sacrifice in ability to meet service requirements. Practical data on request.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue • New York City

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NEW Products

C-8—Reducing Valve

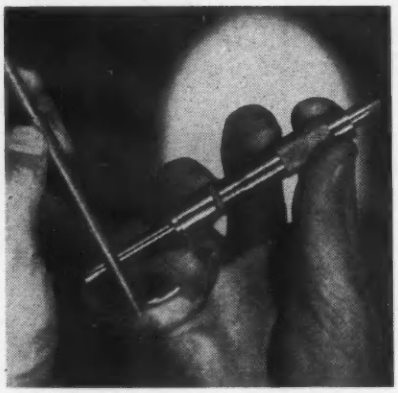
A new reducing relief valve has just been placed on the market by Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich. The Vickers 3000 psi reducing relief valve maintains a constant reduced pressure in a branch circuit regardless of pressure variation in the main circuit and providing the main circuit pressure does not drop below that required by the branch circuit. An integral relief valve is incorporated to provide thermal relief and allows for protection of the branch circuit in the event of failure or malfunction of any of its components.

Vickers reducing relief valve

C-9—Tubular Micrometers

Structural weight is said to have been cut up to 50 per cent in the Tumico tubular micrometers made by the Tubular Micrometer Co., St. James, Minn. The new micrometer has three points of take-up for wear—on the spindle, at the tip, and on the thread.

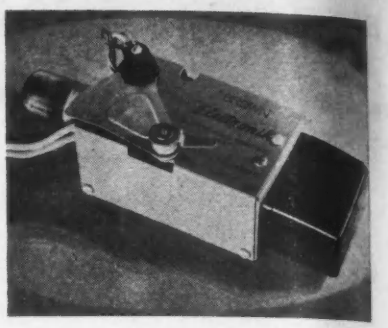
Tumico micrometers are furnished in a variety of types for numerous measuring requirements. These include the conventional type micrometer ranging in size from 0 to 24 in.; the blade type tubular micrometer for measuring narrow depths is furnished in sizes from 0 to 4½ in.; roller mill tubular micrometers may be had with a 3-in. or 6-in. throat depth. A complete line of bow type micrometers with interchangeable mandrels is manufactured in sizes from 0 to 96-in. Internal bores or openings ranging in size from 6 in. to 106 in. may be measured with Tumico inside tubular micrometers. Also, to simplify internal bore measurements, an over-the-bar type tubular micrometer has been designed. These range in size from 8 in. to 28 in.



Tumico micrometer

C-10—New Electronic Control Instrument

The Brown Instrument Co., 4453 Wayne Ave., Philadelphia 40, Pa., has developed a new instrument for the control of pressures and temperatures. Known as the Electr-O-Vane, it is said to be applicable in processes which demand accurate control of temperature ranging from —100 F to 1000 F.



Electr-O-Vane

The Electr-O-Vane control unit operates on the principle that when a metal vane is interposed between two oscillator coils, the state of oscillation can be made to change or stop in an electronic circuit. This change or stopping oscillation causes the electronic circuit to operate a load relay.

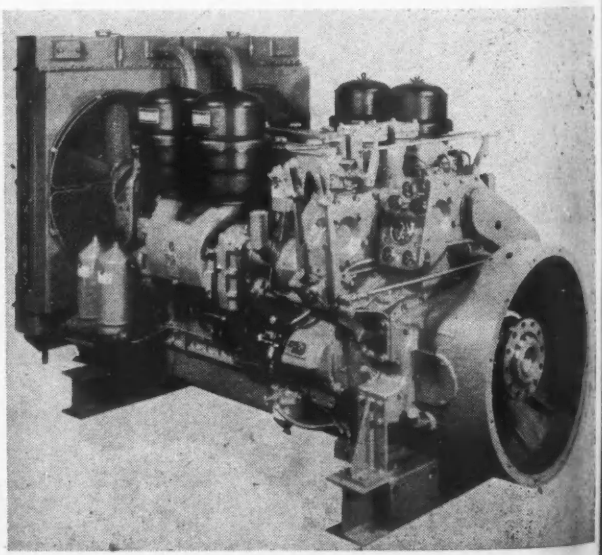
The oscillator coils are molded in bakelite and are moisture-proof. The Brown Electr-O-Vane control is contained in a compact unit. It is unaffected by dust or dirt.

C-11—New Series 71 "Twin-6" Diesels

The Detroit Diesel Engine Division of General Motors Corp., 13400 W. Outer Drive, Detroit 23, Mich., has brought out several new Series 71 "Twin 6" Diesel models.

Each Twin unit is made up of two basic GM six-cylinder two-cycle engines mounted side by side and geared to a single shaft. Units are offered with either right or left-hand rotation. Continuous bhp at 1800 rpm is 276 with maximum intermittent rating of 400 at 2000 rpm.

Probably the most outstanding feature of the new models is the variety of power take-off arrangements that are being made available. Any one of four different transfer gear types can be



General Motors "Twin-6" Diesel with O.H. or SAE "O" size mounting

Before and after — MECHANICAL TUNE-UP

BEFORE YOU TUNE-UP!

Add one quart of Permatex Toon-Oyl to the crankcase oil...and let the car idle. Sludge and carbon-gum binders will dissolve quickly. Valves, piston rings, oil lines and oil screens will operate freely. Then you'll have a clean engine . . . ready for all your mechanical adjustments.

AFTER YOU TUNE-UP!

The best procedure is to drain out the old crankcase oil (with its dissolved sludge and gum) and replace with fresh oil containing one quart of Permatex Toon-Oyl. Then the car owner will get easier starting, snappier pick-up, more power and smoother driving.

Tune-up Chemically!

Rx

ADD 1 QUART OF PERMATEX TOON-OYL TO 5 OR 6 QUARTS OF ANY TYPE OF MOTOR OIL IN THE CRANKCASE

PERMATEX COMPANY, INC., BROOKLYN 29, N. Y.

New PRODUCTS

selected as follows: The H.D. or heavy duty power take-off has been designed to take pulley and chain drive side thrust without the need for a special cradle-mounted sheave or sprocket. The S.S. or stub shaft is used in connection with any of the various types of couplings encountered with heavy duty machinery. The D. F. or drive flange is available for installations where the driven machinery is to be connected directly to the power unit. The O.H. or S.A.E. "O" size housing has been designed to support any close coupled power take-off within the proper horsepower range. Particular attention has been given to its application with torque converters.

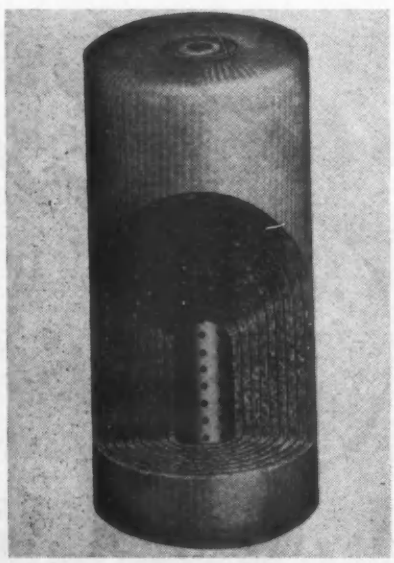
Gear ratios of 1:1 drive, and 1.33:1, 1.77:1, and 2:1 reduction are available with each of the four transfer gear types. An increase in the shock load capacity over earlier models has been accomplished by the introduction of improved heavy duty transfer gears constructed with a 25 per cent increase in face width.

Engine units can be obtained with either radiator or heat exchanger cooling systems, depending upon the nature of application. Specially designed flanges can be furnished for those installations employing remotely located radiators or cooling towers. The engine base has been provided with stronger "I" beam supports. These are so arranged as to facilitate removal of one or both of the engines.

C-12—New Line of Oil Filter Elements

New Engine-Life oil filter elements are manufactured by Engine-Life Products Corp., El Monte, Calif., for all types of lubricating systems. These filters consist of lint-free textiles wrapped in a closely-knit muslin, pressure wound in convolutions around a perforated metal core, and covered with a heavy tubing or muslin jacket. The horizontal flow of oil from outside to inside through the laminated construction materially increases dirt and sludge removal. As elements absorb contaminants they expand, allowing greater dirt storage capacity and a higher saturation point.

It is claimed that Engine-Life filters will not rob oils of their valuable additives. They may be used with any type of oil, regardless of its use or application.

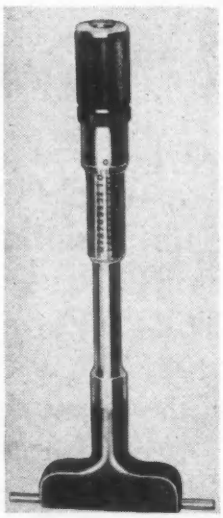


Engine-Life oil filter element

C-13—Inside Micrometer

An inside micrometer called the "rimat" is a new product of the Richards Machine Tool Co., 124 S. Isabel St., Glendale 5, Calif.

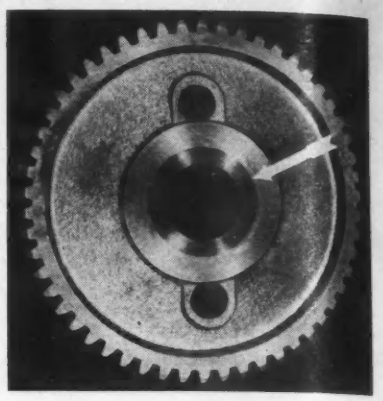
These tools are said to be time savers when machining back of a flange or boring recesses that have to be kept to close limits. In such instances, the tool can be inserted, the measurement taken, the measuring pins retracted and the tool withdrawn.



Rimat inside micrometer

The ends of the measuring pins are hardened and ground on a radius for accuracy and to prevent cramping. All wearing surfaces are hardened and ground. Means are provided so that all wearing surfaces can be adjusted should it become necessary. The head of the tool is blue-black finish; other parts are bright.

The Rimat inside micrometers have a range of 1 in. and are available in two sizes; the 3-in. to 4-in. size with extra measuring rods up to 6 in.; and the 6-in. size with extra measuring rods up to 12 in. Special sizes will be made on order.



Aluminum timing gear with bonded-in steel hub

C-14—Aluminum Gears with Steel Hubs

Aluminum timing gears with bonded-in steel hubs for automotive use have been introduced by the Al-Fin Corp., Hollis, N.Y. These gears are expected to be especially suitable for heavy-duty use, as in engines of trucks and buses. The gears are composed of aluminum alloys chemically bonded to steel hubs by the Al-Fin process, which gives the bond a tensile strength of 6,000 psi.

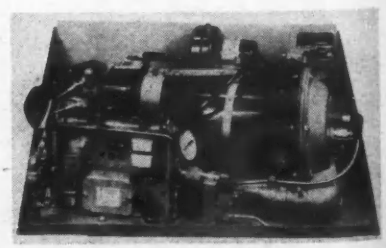
Aluminum alloys are used for strength, and aging of the casting obtains a Brinell hardness of from 85 to 120, depending on requirements.

The Al-Fin process of chemically bonding aluminum and its base alloys to iron and steel is a development which permits the fabrication of bimetallic assembles combining selected physical properties of both metals, and facilitates the production of units requiring the strength of steel with the characteristics of aluminum.

C-15—Booster Heater that Warms Engine

Capable of not only warming the interior of a motor coach or truck, but also of supplying heat to the cooling water of the engine for easy starting in cold weather, a new motor coach, truck and semi-trailer heater, also applicable to house trailer, boat, and Diesel rail-car heating, is now in production by the Surface Combustion Corp., Toledo and Columbus, Ohio. The new heater furnishes its own heat inde-

(*Turn to page 70, please*)



Heater made by Surface Combustion Corp.

—with tools that increase output, cut machine down-time!

There's sweet music—and lower costs—in the sound of tools turning out piece after piece and maintaining production day after day. And now you can get tools that actually cut costs and increase output by using the Carpenter Matched Set Method of tool steel selection. With this method you can "custom-fit" the tool steel to each tool you make. And once you've selected the steel for best results, accurate, easy-to-use heat treating instructions are yours for the asking. Just get in touch with your Carpenter representative for any information you may need to put the Matched Set Method to work. For tools and dies that step up production and stay on the job longer, contact him today. Just call your nearby Carpenter Warehouse or Distributor.

YOU CAN GET RESULTS LIKE THIS BY USING THE CARPENTER MATCHED SET METHOD

PRODUCTION UPPED 167%

MACHINE DOWN-TIME MORE THAN HALVED!

The Job:

Producing aluminum toothpaste tubes in volume quantities on a 200-ton press.

The Problem:

The extrusion die required frequent polishing. Each time it had to be removed from the press, 4 hours of productive machine time were lost.

The Results:

The tool maker, using the Matched Set Method, selected Carpenter K-W (Water-Wear) Tool Steel for greater wear resistance. Output per day was increased 167% and press down-time reduced by more than ½!

THE CARPENTER STEEL COMPANY • 103 W. BERN STREET, READING, PA.

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Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE *and* AVIATION INDUSTRIES**

New advances in general business activity are indicated. The *New York Times* index for the week ended March 22 stands at 148.3, as against 146.1 for the preceding week and 132.6 a year ago.

Sales of department stores during the week ended March 29, as reported by the Federal Reserve Board, equaled 283 per cent of the 1935-39 average, as compared with 286 per cent in the week before. Sales were 10 per cent above the corresponding distribution a year earlier, as against a preceding similar excess of 12 per cent. The total in 1947 so far reported is 13 per cent greater than the comparable sum in 1946.

Electric power production decreased slightly in the week ended March 29. The output was 18.5 per cent above the corresponding amount in 1946, equaling the comparable advance shown for the preceding week.

Railway freight loadings during the same period totaled 829,412 cars, 1.7 per cent less than the figure for the week before but 2.5 per cent above the corresponding number recorded last year.

Crude oil production in the week ended March 29 averaged 4,865,100 barrels daily, 3500 barrels more than the preceding average and 440,950 barrels above the comparable output in 1946.

Production of bituminous coal and lignite during the week ended March 22 is estimated at 12,885,000 net tons, 3.6 per cent above the output in the week before. The total production in 1947 so far reported is 1.4 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended April 3, according to *Engineering News-Record*, is $130.762,000, or 117 per cent more than the preceding weekly figure but 0.2 per cent below the comparable sum in 1946. The total recorded for 14 weeks of this year is 19 per cent more than the corresponding amount in 1946. The increase in private construction is 16 per cent, and the rise in public construction is 23 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended March 29 is 149.4 per cent of the 1926 average, as compared with 149.0 for the preceding week and 108.7 a year earlier.

Member bank reserve balance decreased $118 million during the week ended April 2. Underlying changes thus reflected include a decline of $728 million in Reserve bank credit and a reduction of $654 million in Treasury deposits with Federal Reserve banks, accompanied by an increase of $77 million in money in circulation.

Total loans and investments of reporting member banks declined $376 million during the week ended March 26. A decrease of $7 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $11,070 million, shows a net increase of $3,606 million in 12 months.

First National Helicopter Show Attracts Big Crowd

By Robert C. Mack

FOR the Third Annual Forum of the American Helicopter Society, held in Philadelphia during the last week of March, aeronautical engineers, helicopter manufacturers and operators came from the United States and foreign countries. The attendance was the largest in the history of the Forum; and the First National Rotary Wing Aircraft Exhibit, held at the Camden, N. J., airport, comprised the largest collection of helicopters ever assembled at one place for public display and attracted large crowds. The two-day technical sessions covered a wide variety of subjects.

A development which aroused considerable interest was the Hoppi-Copter, a small one-man helicopter which was described by Horace T. Pentecost, President of Hoppi-Copters, Inc., Seattle, Wash., in his paper "The Economics of the Helicopter for the Individual." Mr. Pentecost hopes to have his small craft in production in about one year, and expects to sell it for less than $1000. Called the motorcycle of the air, the lightweight machine is the outgrowth of a backstrap model which was designed for use by paratroops during the war. It has a two-cylinder, two-stroke, opposed-piston engine which develops 35 hp at 5000 rpm. Total weight of the engine is about 45 lb. The latest model consists of a tricycle landing gear and tubular frame on which is mounted the engine, transmission assembly, mast and dual rotors with coaxial, counterrotating blades. A seat is provided for one person. The machine has a fuel capacity of four gal, service ceiling of 12,000 ft, and a weight of 173 lb, empty. Rotor diameter is 15 ft and cruising speed is 90 mph. Three pilot models of the Hoppi-Copter are now being built.

The rotary-wing aircraft exhibit, held at the Central Airport near Camden, N. J., featured flights and maneuvers of eight helicopters. Considerable interest was shown in the exhibition of a captured German submarine rotary-wing kite designed by the German navy to be trailed at the end of a line behind a submarine while its pilot watched for enemy craft. Exhibited by the Kellett Aircraft Corp. was the XR-8, an experimental intermeshing-rotor craft built for the Army. This plane was powered with a 250 hp Franklin, and equipped with two lateral 16-ft counter-rotating rotors. This XR-8 was the prototype for a larger Kellett helicopter, the KH-2, which is powered with two 550 hp engines and which, according to the manufacturer, will have a range of 180 miles with a cruising speed of 90 mph, and will carry either 10 passengers or a 2900 lb cargo. The KH-2 was not exhibited.

Also shown were the Herrick Convertaplane, one wing of which rotates during landings and takeoffs, but remains fixed during en-route flight; a Pitcairn autogiro; Platt Le Page lateral twin-rotor; Piasecki fore and aft twin-rotor; and several Firestone, Bendix, Bell and Sikorsky helicopters.

Latest model Hoppi-Copter with Horace T. Pentecost, its designer, at the controls.

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Tough Jobs

Go to SKF-equipped Trucks

Pulling a 75-ton Carry-all Trailer loaded with a 93-ton transformer 20 feet high is typical of the tough jobs put up to SKF-equipped trucks. And helping Autocar trucks make such jobs easier are SKF Deep Groove Ball Bearings, SKF Self-Aligning Ball Bearings and SKF Cylindrical Roller Bearings. Radial and thrust load carriers, these bearings assure correct alignment . . . many years of continuous low-cost running. Using SKF Bearings means improving the performance of your trucks and buses. 6233

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PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

Ford Motor Co.—**Herman L. Moekle**, Vice-Pres. in Charge of Finance, has retired. He has also relinquished his post as director of the company. **J. F. Bachman** appointed director of the Industrial and Marine Sales Dept. **John Dykstra** named general production assistant.

Kaiser-Frazer Corp. — **Dean Hammond** appointed Chief Engineer at Willow Run automobile plant. **A. C. Breitenbeck** made factory manager of Detroit Engine Div.

The Four Wheel Drive Auto Co.—**Samuel N. Pickard**, Pres. of the National Manufacturers Bank, made a director of FWD.

Mack - International Motor Truck Corp.—**John A. Sloan**, District Manager of Chicago Branch; **A. L. Monck**, District Manager of Des Moines Branch.

Nash-Kelvinator Corp.—**E. W. Bernitt**, General Plant Engineer.

Packard Motor Car Co.—**William E. Osband**, Manager of Great Lakes Sales region. **Don C. Miller**, Manager of expanded Organization and Analysis Dept.

Tucker Corp.—**James D. Stearns** appointed Controller, heading the Financial Administration Department.

Boeing Aircraft Co.—**Allen W. Jacobson**, Factory General Supt.

Link Aviation, Inc.—**James F. Newlon**, Manufacturing Manager.

Curtiss-Wright Corp. — **Robert W. Lea**, Pres. of Johns-Manville Corp., elected a member of the Board of Directors.

All American Aviation, Inc.—**Walter V. Trelease**, appointed manufacturing representative in charge of sales and product development.

Beech Aircraft Corp.—**Lee H. Smith**, Sales Manager. **Phil McKnight**, Public Relations Director.

Pittsburgh Plate Glass Co. — **Guy Berghoff**, direction of all advertising activities.

Jessop Steel Co., Carbide and Cast Alloy Div.—**A. J. Fischer**, made Manager.

Eutetic Welding Alloys Corp.—**Albert E. Zeisel**, Vice-Pres. in charge of Sales.

Revere Copper & Brass, Inc.—**C. Donald Dallas**, elected Chairman of the Board of Directors and **James J. Russell**, elected President.

Salsbury Motors, Inc. (subsidiary of Northrop Aircraft, Inc.) — **Orville E. Mohler**, named General Sales Manager.

Menasco Manufacturing Co.—**E. Ray Proctor** appointed Engineer in Charge of Landing Gear Div.

Gardner-Denver Co. — **Edgar F. Schaefer**, elected President and **H. G. Myers**, Chairman of the Executive Board.

American Society of Tool Engineers —**W. B. Pierce** elected President.

Indian Motorcycle Co.—**L. J. Kinder**, made Factory Manager.

Sun Oil Co.—**Paul D. Barton**, Chief Engineer of the Manufacturing Dept.

National Malleable & Steel Castings Co.—**Stowell C. Wasson**, elected a Director of the company.

Canadian Car & Foundry Co., Ltd.—**John J. House**, General Service Manager Bus Div.

The Ohio Crankshaft Co. — **Roy V. Thomas**, Personnel Manager.

E. W. Bliss Co. — **Robert C. Enos**, elected Chairman of the Board.

Young Radiator Co. — **Theodore C. Rademacher, Jr.**, Advertising and Sales Promotion Manager.

Detrex Corp.—**Henry J. Lucey**, Sales Manager of the Oil-Extraction Div.

Eaton Manufacturing Co.—**John C. Virden** and **Martin P. Winther** members of the Board of Directors.

Airquipment Co.—**B. W. deGuichard**, elected President.

Titeflex, Inc.—**Dr. Melville F. Peters**, Chief Engineer.

The Carborundum Co.—**H. K. Clark**, elected President; **Arthur Batts**, elected Chairman of the Board; **Edwin R. Broden**, Vice-Pres. in charge of operations, member of the Board of Directors and a member of the Executive Committee.

Marlin-Rockwell Corp.—**S. W. Brandel**, elected President; **I. A. Cummings**, Vice-Pres. and Works Manager; **H. A. Johnston**, elected to new office of Vice-Pres. and Sales Manager, and **Daniel Gurney**, named to the new office of Vice-Pres. and Chief Engineer.

The Warner & Swasey Co.—**Donald M. Pattison**, Member of the Board of Directors and Vice-Pres. in Charge of Sales.

Thompson Products, Inc. — **Philip Somerlad**, General Sales Manager of the Service Div.

U. S. Broach Co.—**Arthur A. Atwell**, elected a Director and Senior Vice-President.

Air Briefs

(*Continued from page* 34)

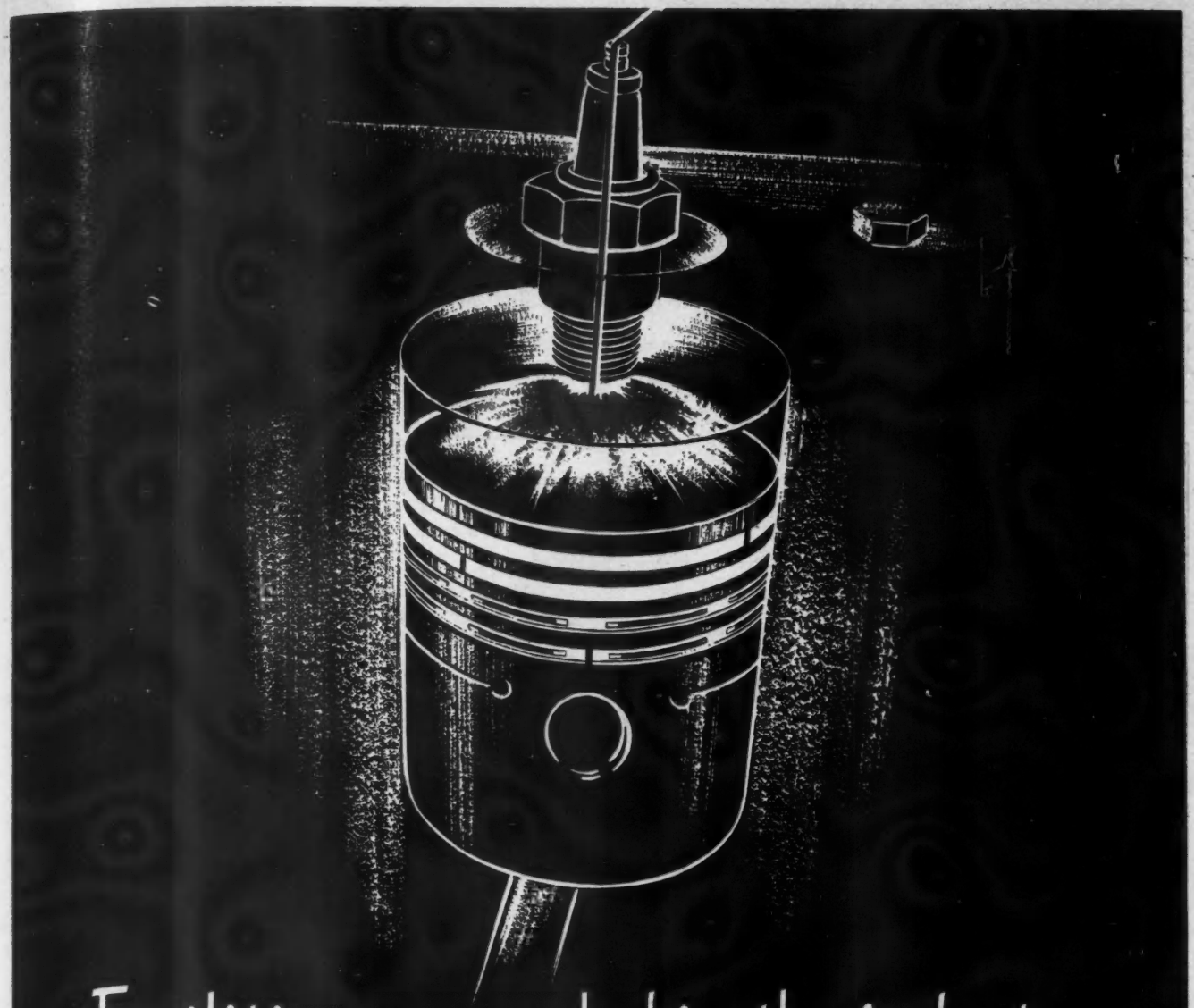
erating plant producing 18,000 hp for testing all forms of gas turbine power plants.

Commando Comeback

Look for a strong, though long-belated comeback of the Curtiss C-46 Commando as an airline type. The recent award of an Approved Type Certificate by the CAA clears this much-maligned craft of largely erroneous charges and opens the way for large-scale sales to non-scheduled airlines and industrial users. The important fact regarding the Commando is that War Assets Administration has more than 600 of them for sale together with spare engines and sub-assemblies. The aircraft, all surplus AAF types, are valued at $30,000,000 and the engines and parts are worth $70,000,000. About 400 of the planes are still overseas. The Commando, world's largest twin-engined airliner, carries about twice as much as a DC-3, thereby reducing flying cost per ton-mile almost in half. It is licensed at a gross weight of 45,000 lb, giving it an approved useful load of 17,500 lb. Slick Airways, the nation's largest air-freight service, operates 10 Commandos and has flown 14,000,000 ton-miles, about three-quarters the total of the nation.

New Ceramic

The Bureau of Standards has announced a new family of all-crystalline porcelains having high strength and heat resistivity. Conventional porcelain contain feldspar, which reacts as a flux with clay and silica dissolving them into a viscous liquid that cools and produces the familiar "glassy" appearance of porcelain. The Bureau of Standards has completed a 6-year research program designed to eliminate this glass in porcelain and has developed porcelains composed of alumina, beryllia, zirconia, thoria and other metallic oxides. At a temperature of 1800 F, the new porcelain develops a strength of 14,000 psi over periods as high as 2600 hours. They have been developed particularly for aircraft gas turbine application in combustion chamber liners, as turbine blade coatings and for rocket nozzles.



Facilities unequaled in the industry

Since its founding in 1911, Sealed Power has held a position of leadership in its field. Today Sealed Power's manufacturing plants, laboratory facilities, and technical staff form a combination unequaled in the piston ring industry. We have been honored by close collaboration from leading automotive engineers. The teamwork thus developed is at your service, to help make your good engines even better.

SEALED POWER CORPORATION

MUSKEGON, MICHIGAN · STRATFORD, ONTARIO

SEALED POWER PISTON RINGS

PISTONS · CYLINDER SLEEVES

Building Heavy Duty Trucks

(*Continued from page* 33)

group of two operators attach chains at the front and rear suspended from the overhead crane. The chassis is lifted part way and the rear end fitted into the roll-over fixture at the end of the conveyor. This fixture has a turntable arrangement which is rotated 180 degrees to turn the chassis right-side-up while still lashed to the crane. Then the frame is withdrawn from the roll-over fixture and ready for hoisting to the upper line. At this area there is a rectangular opening in the ceiling to permit the transfer of chasses from the lower to the upper lines. The crane is controlled at both points: an operator on the lower floor handles the controls until the chassis is through the floor opening; then the operator on the second floor takes over to guide the chassis over the line and onto the conveyor.

It is of interest at this point to mention that the frame line on the lower floor runs about 220 ft in length while the final line to be described below is 618 ft long. The final line traverses an impressive set-up of sub-assembly stations arranged in parallel rows at right angles to the conveyor. As on the lower floor, each station is scheduled in advance so as to have the proper unit ready for installation as a chassis approaches the station.

First major station is steering gear. Owing to the variety of these, a bank is kept in readiness on a large storage rack and the proper unit for the chassis is scheduled out, lifted by hoist and transferred to the assembly line.

Next is the engine line. Autocar makes three standard basic engines, supplies two Cummins Diesel engines—Models HB6 and NHBD, and offers a large Hall-Scott gasoline engine for the largest vehicle. Scheduling of engine equipment is quite complex since it includes engine accessories and transmission options. This department receives stripped engines on the one hand and complete transmissions built for a specific chassis on the other. Engines progress on a floor conveyor for installation of accessories while the gear boxes are stored in racks at the side.

As the assembly line moves on we find the installation of the engine exhaust system, propeller shafts, radiators, running boards, gas tanks, and other items. The last step at this stage of the line is the first running of the engine under its own power when hooked up with the complete power train. In preparation for this, a trained crew hooks up the overhead-mounted exhaust pipe and connects up a portable rig containing a battery and ignition switch. This rig is hooked onto the front bumper and moves with the chassis while the conveyor is in motion. The engine is started and permitted to run while one of the operators shifts the transmission through the gears and observes the rotation of the axle shafts. Then the external rigging is disconnected and the chassis is ready for paint.

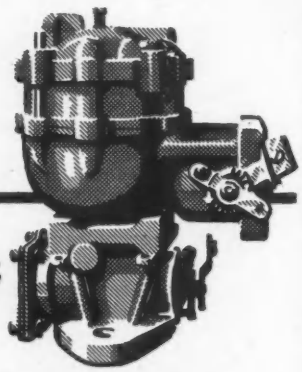
At this point the chassis enters a wash booth where it is washed, masked at various points to keep out the paint, and fenders scrubbed with oleum spirits. Spraying is done in water-back type spray booths installed by Newcomb-Detroit, while drying is handled in an adjacent Fostoria infra-red baking oven.

Following painting, the chassis is ready for cab installation. Cabs are built up from stampings, assembled and welded in a department on the floor above, trimmed and painted, then lowered over the chassis through an opening in the floor.

Wheel and tire assemblies are made up in a separate department and transported to a station immediately follow-

(*Turn to page* 62, *please*)

5 out of 9*



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BEHIND that big preference for Oakite cleaning materials is the bigger story of efficient cleaning at prices that neatly fit into your cost estimates. It's convincing proof that Oakite *delivers the goods.*

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Let's say that you make pistons, spark plugs, gears, crankshafts, instruments or other parts. No matter the production-snarling cleaning problems that may arise, Oakite has research and service closely meshed to help you untangle them. Simply consult your local Oakite Technical Service Representative. He'll provide you with efficient Oakite materials and methods for preparing surfaces for plating or painting; cleaning before heat treatment; descaling, rust-proofing and related operations. Bringing you the best cleaning at the lowest possible costs is his business. Maybe his business can help yours. Oakite Products, Inc., 28A Thames St., New York 6, N. Y.

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Why not check your requirements NOW? Send us your prints and your specifications. Remember, Johnson Bronze makes every type of Sleeve Bearing . . . an unfailing source of supply with the highest reputation for quality. Write, wire or call—TODAY.

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SLEEVE BEARING HEADQUARTERS

ing the cab drop.

We are now about at the end of the 618-ft conveyor line. Here the engine is test-run again, headlamps aimed, and the vehicle given its final inspection in preparation for road testing. Every vehicle is given a thorough test run on the road and is then adjusted and given the last inspection before delivery to the customer.

Scheduling is one of the most important activities contributing to the smooth operation of the final assembly line. As is customary, the sales department establishes the desired schedule of car deliveries in accordance with promises to the customers. However, owing to the complexity of the operation of a custom building plant, and further complicated by the shortages which plague all manufacturers, the sales schedule is modified by the production department at various times depending upon the availability of units of every description.

Scheduling of the final line is done daily, one day in advance, with tentative schedules for the following two days to meet contingencies. For each vehicle the engineering department prepares a standard form, reproduced here, covering the "Basic Specification" on one side of the form; and extras and special specifications entered on the "Car Building Record" on the reverse side. Copies of this record are filed at all principal stations such as the frame assembly, and sub-assembly stations, while one copy moves with the chassis from start to finish.

The Car Building Record also provides the information necessary for the scheduling of steering gear, motor building, transmission production, etc. The record is also used by the inspection department to assure conformity with specifications. Each inspector is required to initial the items that he inspects.

Unless one is familiar with specifications variations of this nature, it is difficult to appreciate the complexity of the scheduling function in building heavy duty vehicles. Let us consider some of these variations briefly. For one thing, Autocar has ten basic chasses in the line and on the average each chassis permits of about four variations in size. Add to this the three Autocar engines, two Cummins Diesels, and the Hall-Scott engine as options. Then we have the variations in front and rear axles—type and size, gear ratio, brakes, etc. In addition, Autocar builds two basic transmissions available in either four-or five-speed models; and two- and three-speed auxiliary transmissions. With larger engines they supply Spicer transmissions and auxiliaries as specified.

This is by no means the end of the story. Each Car Building Record carries with it a Brake Sketch giving in complete detail the specifications for the entire brake system of an individual vehicle. It is a matter of principle at Autocar to tailor-fit the brake system to each job, depending upon the nature of the operation and gross vehicle weight. Consequently, each vehicle is studied by the brake engineer and each one provided with equipment specifically suited to it.

We mentioned earlier that over a period of time the company contemplates a complete reorganization of major departments such as motor and transmission building. Although these moves are still in progress, we can comment on a sampling of machine tools of advanced type already in use.

In the motor department we noted an installation of two of the new Ex-Cell-O inclined head precision boring machines, each with six spindles. This precision cylinder boring equipment is capable of holding extremely fine tolerances on roundness and freedom from taper. Moreover, the two machines are capable of meeting the maximum schedules required in this plant. Supplementing the boring machines is a new single-spindle Barnesdrill honing machine fitted with Micromatic hones.

Another touch of modernity is found in the new W. F. & John Barnes horizontal boring machine for line boring the cam and crank bearing lines in the crankcase section. This is an extremely heavy and massive machine, takes two cases at a time, and replaces an older

(*Turn to page* 64, *please*)

- Buell Air Horns are tops in warning signal efficiency.
- Installed as original equipment on many Trucks and Buses.
- They reduce maintenance costs by decreasing stops, starts and slowdowns.
- All records prove that they save tires, brakes, clutches and gears.
- Cut gas and oil consumption.

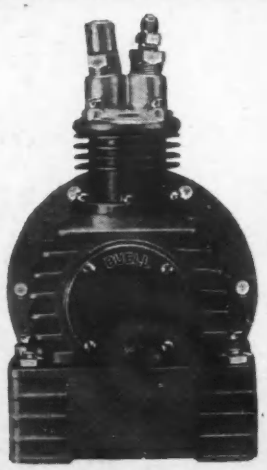
With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine, and tires again, to regain speed. This all costs money. We believe a Buell Air Horn is worth $100.00 yearly on any heavy highway vehicle. Then remember a Buell will last more than 10 years. How would you rate a $100.00 investment that earned $100.00 yearly for 10 years. Ask the man who has a Buell.

BUELL AIR COMPRESSOR

- Used on Passenger Cars, Trucks, Buses, Boats and Planes.
- Small and compact in size . . . efficient and powerful in action.

Buell engine-driven compressors supplied air to operate air brakes in thousands of R.C.A.F. aircraft. Only a combination of quality and precision workmanship could meet the requirements of this type of service.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.



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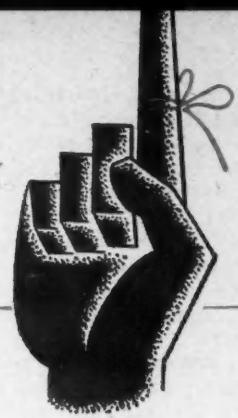
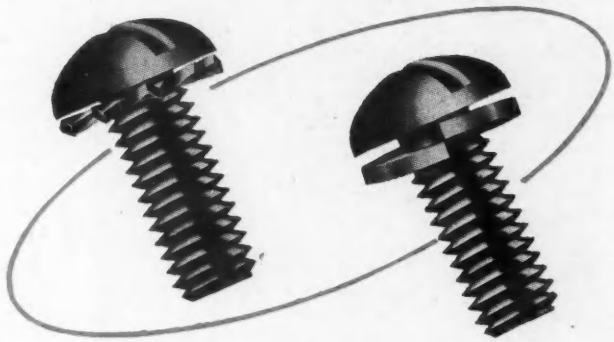


the lock washer



Quality control is written into your purchase order when you specify SEMS, for SEMS bring you both screw *and* washer pre-assembled as a unit. The washer can't fall off!

Driving is easier, faster . . . no finger-fumbling, no lost washers. Inventories are always in balance. Remember, with SEMS you eliminate the entire washer and screw assembly operation right on your purchase order!

Write any listed manufacturer for free SEMS Data Book.

use SEMS the *MODERN* fastener unit

SEMS are Pre-Assembled Washer and Screw Units in which the Washer is held on the Screw by the Rolled Thread and is free to rotate.

SEMS ARE AVAILABLE FROM THE FOLLOWING MANUFACTURERS

Corbin Screw Division
The American Hardware Corp.
New Britain, Conn.

Eaton Manufacturing Co.
Reliance Division
Massillon, Ohio

The Lamson & Sessions Co.
Cleveland, Ohio

National Lock Co.
Rockford, Illinois

The National Screw & Mfg. Co.
Cleveland, Ohio

New England Screw Co.
Keene, N. H.

Pheoll Manufacturing Co.
Chicago, Illinois

Russell, Burdsall & Ward
Bolt & Nut Co.
Port Chester, N. Y.

Scovill Manufacturing Co.
Waterville Division
Waterville, Conn.

Shakeproof Inc.
Division of Illinois Tool Works
Chicago, Illinois

Steel Co. of Canada, Ltd.
Hamilton, Ont., Canada

Stronghold
Screw Products Inc.
Chicago, Ill.

American Screw Co.
Providence, R. I.

Central Screw Co.
Chicago, Ill.

Chandler Products Corp.
Cleveland, Ohio

Continental Screw Co.
New Bedford, Mass.

machine of similar type but of lighter construction. The management is particularly proud of its Gisholt Dynetric balancing machine for crankshafts, certainly the most advanced machine of its kind known to the art.

The transmission department presents a modern gear operation, contains among other items of equipment Barber-Colman and Gould & Eberhard hobbing machines, and Fellows gear shapers. In keeping with the modern trend of gear practice Autocar has a battery of the familiar National Broach Red Ring gear shavers which are used for shaving transmission and axle gears to eliminate grinding after heat treatment.

From the standpoint of interesting "wrinkles," consider the tube bending fixture illustrated here. The vehicles require a multiplicity of intricately bent tubing for fuel, oil and brake lines, mostly special for each job. Originally it was the practice to bend tubing to fit while the truck was on the assembly line. Not only was this time consuming but it did not fit into the scheme of a mechanized line. Now they have a number of these fixtures, each one provided with a variety of tooling as shown. With this equipment it is possible for the operator to make up any kind of bent tubing directly from a sketch and ready for installation without fitting.

80 Bumper Sets Per Hour

(*Continued from page* 44)

three sections—two end sections of deep drawn curved pattern, and a deep center cross-member section. The two end sections are drawn from a single blank, 11½ in. wide x 97½ in. long, using high tensile NAX steel 0.090 in. in thickness.

Press operations follow a simple pattern and are performed at the high rate required to meet car building schedules. The major steps are as follows: Blanking, Drawing in a 750-ton press, Trimming, Flanging in a 350-ton press, Parting the two halves in a small press, Flanging the sides in a 350-ton press fitted with two dies each holding two stampings, Piercing the jack holes in a 750-ton press.

Following press operations the brackets are welded in the bumper section in special welding booths. The stampings are then delivered to the polishing department where the first step is to polish out die marks, scratches, and roughness on individual polishing machines.

The bumpers are then placed in fixtures on a moving conveyor and pass over two parallel lines of automatic polishing machines. Moving in one direction they are polished from the curved tip end, then they are reversed to finish from the blunt end on the other line.

In preparation for plating the work is cleaned and degreased in an automatic washing machine, then transferred to the plating conveyor. The first stage is copper plating. The work is washed and electro-cleaned, given warm and cold water rinses, a copper strike in a cyanide tank, and is put through a copper plate cycle, followed by nickel plating.

Prior to chromium plating, the bumper parts pass through an acid dip in five successive tanks. A reclaim rinse and cold and hot rinses follow the chromium strike and the bumper bars are ready for final buffing and visual inspection. The coating comprised of copper, nickel and the flash of chromium is 0.002 in. thus exceeding usual commercial practice which specifies a total coating of about 0.0015 in.

The final step is to spray the inside area of all sections of the bumper with aluminum paint for appearance as well as corrosion resistance.

NOPAK Reciprotrol Valve mounted on Arbor press results in fast, semi-automatic, air-powered operating cycle.

Faster Mounting Less Fatigue

— with NOPAK Reciprotrol Valve

This hand-operated arbor press, employed to mount tires on tricycle wheels, was converted to fast, semi-automatic operation by the application of a NOPAK Model D Air Cylinder controlled by the new, revolutionary Reciprotrol Valve.

Now, the operator merely places the tire, mandrel and wheel in position and trips the Reciprotrol Valve with the touch of a finger. The cylinder then automatically presses the tire on to the wheel and returns to starting position while operator picks up units for the next assembly.

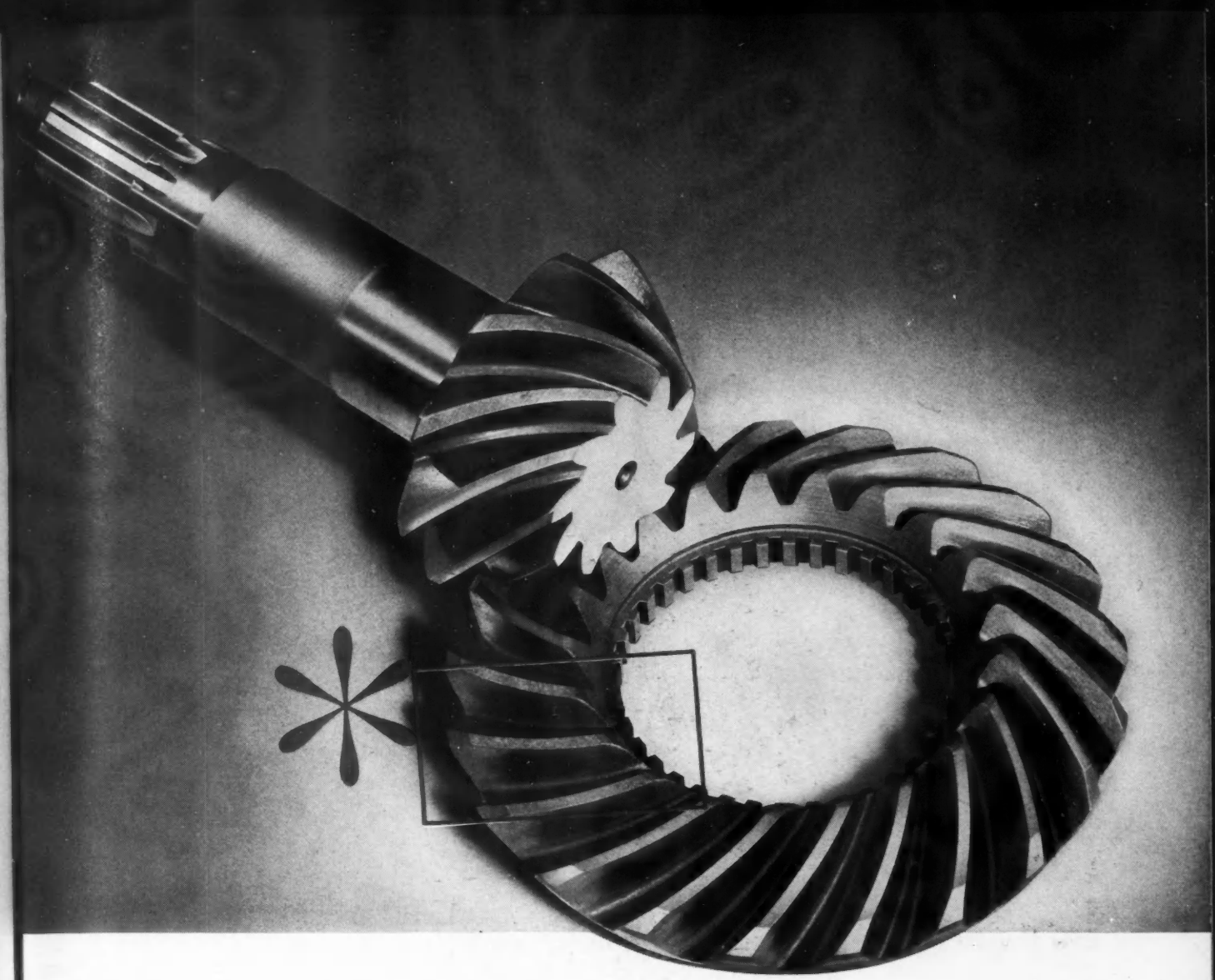
The result? Mounting time cut 50%; operator fatigue reduced to a minimum. In fact, where formerly two men relieving each other in an 8 hour shift were required, the machine is now attended by one woman operator working a full 8 hour shift.

GALLAND-HENNING MFG. CO., 2774 S. 31st Street, Milwaukee 7, Wis.

NOPAK Reciprotrol Valve provides full-, semi-automatic or manual control of length, speed and position of cylinder stroke. Write for details.

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE
Representatives in Principal Cities

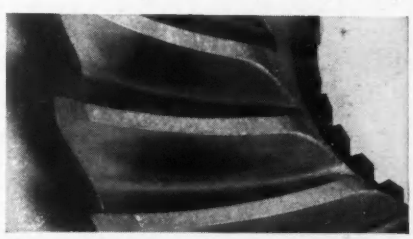
Readers
of AUTOMOTIVE and AVIATION INDUSTRIES are always
Well Informed



These marks are proof of physical fitness

THESE spiral bevel gears have a long, hard-working, quiet life ahead of them, as you can see clearly by the unretouched "test-marks" in the photograph at the right. These marks are made by coating the teeth with a pigment, then running the gears in proper position to remove the coating where tooth contact occurs. Observe the *uniformity* and the *localization* of tooth contact at the central portion of each tooth: proper for this application—proof of physical fitness for the job.

There's no magic to making gears as sound and as silent as these. We establish one *and only one* set of standards—then stick to it. Our men know our standard and hold to it—day after day—at every stage of operation from blanks to final lapping. That's the *only* way we know how to do business. If this fits in with your ideas, give us a call. Our engineers can start from a sketch, print, or at any stage of the development. Any time you say.



* *Uniform contact, localized at the strongest portion of each tooth is proof of maximum wear.*

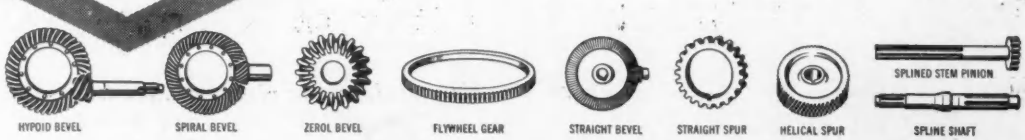
DOUBLE DIAMOND TRADE MARK GEARS

Made by

AUTOMOTIVE GEAR WORKS, INC.

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



PERMANENT RESILIENCE

Resilient parts made from HYCAR synthetic rubber *stay* resilient. That's partly because of HYCAR's unusual chemical stability—its resistance to oil and gas, acids and most other chemicals. And parts made from HYCAR are extremely resistant to the effects of oxidation, sunlight, and normal aging. A HYCAR sealing ring, for example, will maintain a positive seal through years of service even when constantly exposed to oils and acids inside the pipe, and sunlight and salt air outside.

Other unusual and valuable properties are listed in the box at the right. But most important, these properties may be had in an almost limitless number of combinations, each designed to meet the specific service conditions of the finished part. Parts made from HYCAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say ask your supplier for parts made from HYCAR. Test them in your own applications, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Dept. HD-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE — insuring dimensional stability of parts.*
2. *HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.*
3. *ABRASION RESISTANCE—50% greater than natural rubber.*
4. *MINIMUM COLD FLOW—even at elevated temperatures.*
5. *LOW TEMPERATURE FLEXIBILITY — down to —65° F.*
6. *LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.*
7. *AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.*
8. *HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.*
9. *NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)*

Hycar

Reg. U. S. Pat. Off.

American Rubber

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

Publications Available

(*Continued from page* 45)

A-98—Rotary Pumps

Worthington Pump and Machinery Corp.—Bulletin W-484-B1 covers general service Type GA rotary pumps. Illustrations of the models available, services performed, specifications and dimensions tables are included. Bulletin W487-B108 covers heavy duty rotary pumps. The folder is illustrated, contains a performance data chart, features of the pump, specifications and dimensions charts.

A-99—CrysCoat Process for Pre-Cleaning

Oakite Products, Inc.—Has announced the publication of an illustrated, 6-page service report giving particulars and valuable new data on the Oakite CrysCoat Process for pre-cleaning, conditioning and rust-inhibiting ferrous metal surfaces prior to organic finishing.

A-100—2ML Milling Machines

The Cincinnati Milling Machine Co.—The various models are illustrated, a page is included giving highlights of design, general specifications, standard and extra equipment which can be supplied and a page showing dimensional drawings.

A-101—Electronic Controls

Wheelco Instruments Co. — 20-page booklet, in color, on Wheelco Electronic Controls. The booklet, which is a condensed catalog, contains listings and specifications on standard company instruments. A separate 4-page price list is included.

A-102—Electrolimit Height Gage

Pratt & Whitney, Div. of Niles-Bement-Pond Co. — 8-page illustrated folder describing the Electrolimit Height Gage. Included are specifications and a page of meter scales.

A-103—Rectifiers

Richardson-Allen Corp.—Catalog covering the scope of uses of Selenium Rectifiers in the plating fields and in general industry, explaining their operations and advantages.

A-104—Portable Drilling and Tapping Machines (Horizontal)

Kaukauna Machine Corp.—22-page bulletin illustrating Series 125 Portable Horizontal Drilling and Tapping Machines and Model 700 Indexing Table. Described are three series 125 units together with photographs and specifications. Many operational views of the various head positions possible with these versatile and flexible portable horizontal drilling and tapping machines are shown.

A-105—Stud Welders

Nelson Sales Corp. — New 36-page brochure, describing a wide variety of applications of high-speed stud-welding. Standard and specialized studs are illustrated and detailed specifications and physical characteristics are also tabulated in the booklet.

A-106—Compressors

Ingersoll-Rand Co.—The model 15T Compressor is the subject of a new color folder. Photographs and text give features of the compressor and a page is included giving engineering data, sizes and dimensions.

PERFORMANCE
as smooth as the flow of water
DOLE
Thermostats
IN A RANGE OF TYPES FOR EVERY CAR
• Positive control of cooling liquids, as achieved by a Dole Thermostat, contributes to better motor operation and improved car performance —at all seasons. Its plus values are quick warm-up with specific savings in gas, oil and motor wear.
THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue, Chicago 12, Illinois
Los Angeles
Detroit
Philadelphia

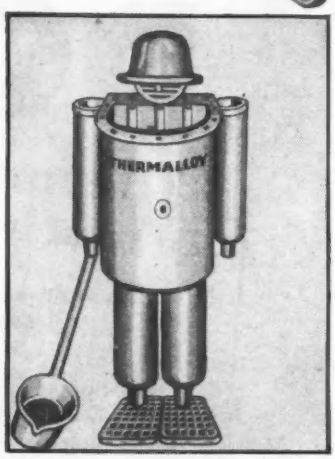
Banish Fear

OF COSTLY SHUT DOWNS
with THERMALLOY
HEAVY DUTY
PIN LOCK
CHAIN

Notice the simplified construction of three part (patented) PIN LOCK CHAIN and compare with the chain you are using. Notice too absence of rivets and cotters—simplified assembly. Little slack required for assembly.

This chain design permits full utilization of THERMALLOY high physical properties. Optimum strength and ductility at high temperatures are the result of extensive research and close metallurgical production control.

MUFFLES—RETORTS—POTS
FLEX BOXES—BASKETS—TRAYS
AND FURNACE PARTS



AMSCO ALLOY and THERMALLOY
are identical

AMERICAN Brake Shoe COMPANY
ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO.

New Crosswind Landing Gear

(*Continued from page* 42)

Goodyear's contract is not regarded as completed until the company provides the re-engineered article, data and drawings. Since Goodyear has indicated interest in producing its castering wheel commercially, it will have a considerable advantage over any competitor who may wish to make a similar article from the CAA data and drawings. Not only does Goodyear have the valuable engineering experience developed in the experimental program, but it also has patents on its single-disk aircraft brake wheel which was used for the castering development, because of the room in the hub for the castering mechanism. There is no indication that Fairchild or any other company will produce the Fairchild-developed gear commercially, at least in its present form. There is possibility that the Firestone development will be carried on by that company commercially, but the gear is still in an early stage of development, and its future may not yet be predicted accurately.

As a result of the encouraging experience in contracting development work to manufacturers, CAA may let additional future contracts for other developments aimed at safer and easier-to-fly personal planes. A Government-industry engineering conference in Washington late in April, at the invitation of William A. M. Burden, Assistant Secretary of Commerce for Air, is expected to outline the broad problems of research which need to be attacked in order to speed the development of an acceptable personal plane for the mass market buyer.

Roto-Shaving

(*Continued from page* 29)

vances under the ram for clamping. At this point the machine goes through its cycle automatically, including control of flow and temperature of the quenching oil.

The company has completed a major program of plant modernization and rearrangement which included the installation of much new equipment. The items mentioned above constitute simply a sampling of some of the more unusual tooling out of the gamut of machinery now in full operation.

Army Buys More P-80s

The Army Air Forces recently ordered 134 improved Lockheed P-80B Shooting Star jet fighter planes worth $8,681,960 from the Lockheed Aircraft Corp. This is the fourth order that the Army has placed for the P-80.

to speed production, and cut your costs

For short cycle malleabilizing, and annealing or normalizing steel, aluminum or magnesium castings, select an EF furnace,—they are built in many different designs, and in sizes to meet any requirement. Each installation is engineered and built specially for the particular and individual need,—thus assuring the smooth, continuous flow of material through the heat treating process, fully up to the desired capacity and physical specification.

EF furnaces will give you the utmost in efficiency and economy, and reflect the advantage of many service-proved features—conceived and perfected by EF engineers—and available only in EF design. These advantages include the EF radiant tube and EF heat exchanger, which combine to assure extremely high combustion efficiency; EF heavy, cast alloy electric heating elements, EF roller design and mounting, EF special atmosphere generators and many other devices that assure uniform temperature throughout the furnace, accurate control of heat within the required limits, low maintenance, high hourly outputs, and uniform, low cost, dependable operation.

Let EF engineers with their long and outstandingly successful experience work with you on your next heat treating job!

EF

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES
FOR ANY PROCESS, PRODUCT OR PRODUCTION

WILSON ST. AT PENNA. R.R.
Salem-Ohio

New Products

(*Continued from page* 54)

pendently of the engine, so that the vehicle may remain outdoors in cold weather yet the engine can easily be started or the passenger space may be warmed without running the engine, or both, as desired. The heater operates on the same fuel as used in the engine, whether Diesel fuel or gasoline.

Operating in conjunction with the regular cooling system of the engine, the heater if necessary can deliver approximately 75,000 Btu per hour. This amount of heat in addition to that produced by the engine when it is running is enough not only for vehicle warming, but also is sufficient to warm quantities of fresh air for ventilation, hot air for windshield defrosting, etc. Control of heater operation is entirely automatic, or the heater may be turned on and off by the operator.

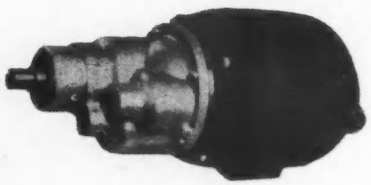
The heater incorporates a horizontal combustion chamber and heat exchanger. All of the heat-liberating surfaces of the heat exchanger are surrounded by cooling water from the engine. Fuel from the engine's fuel tank is supplied to the heater by a small electrically-driven fuel pump. The fuel is then sprayed into the combustion chamber by an atomizing nozzle. Vaporization of the fuel is further obtained by filtered air from a combustion air fan, the air entering the combustion chamber tangentially, thus producing a whirling or spinning action of the flame.

The engine cooling water is circulated through the heater either by the engine water pump, or by an electrically driven auxiliary pump, or both, depending upon the individual characteristics of the installation.

a name that signifies

MOTOR dependability . . .

Lamb Electric



Year after year of trouble-free service in home appliances, business machines, portable electric tools, industrial machines, aircraft components and portable devices, has won for Lamb Electric Motors a reputation for rugged dependability.

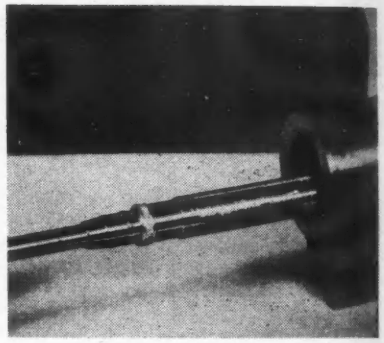
This is one of the reasons why Lamb Electric Motors are going into more and more of America's finest products.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

C-16—New Tracer for Deep Bores

Physicists Research Co., 321 S. Main St., Ann Arbor, Mich., announces a new tracer to be used with the Profilometer for taking microinch surface roughness measurements in deep bores such as hydraulic cylinders, camshafts and tubing. This tracer, known as Type LA,



Tracer made by Physicists Research Co.

will measure to any desired depth in holes as small as ¾ in. ID, and can be used with any type of Profilometer. The diamond tracing point is self-adjusting to the work surface.

The Type LA tracer is mechanically operated by means of a Mototrace and Type BA Linkarm. By using Linkarms of the proper length for each application, measurements can be taken with the one tracer at various depths to 36 in. or greater.

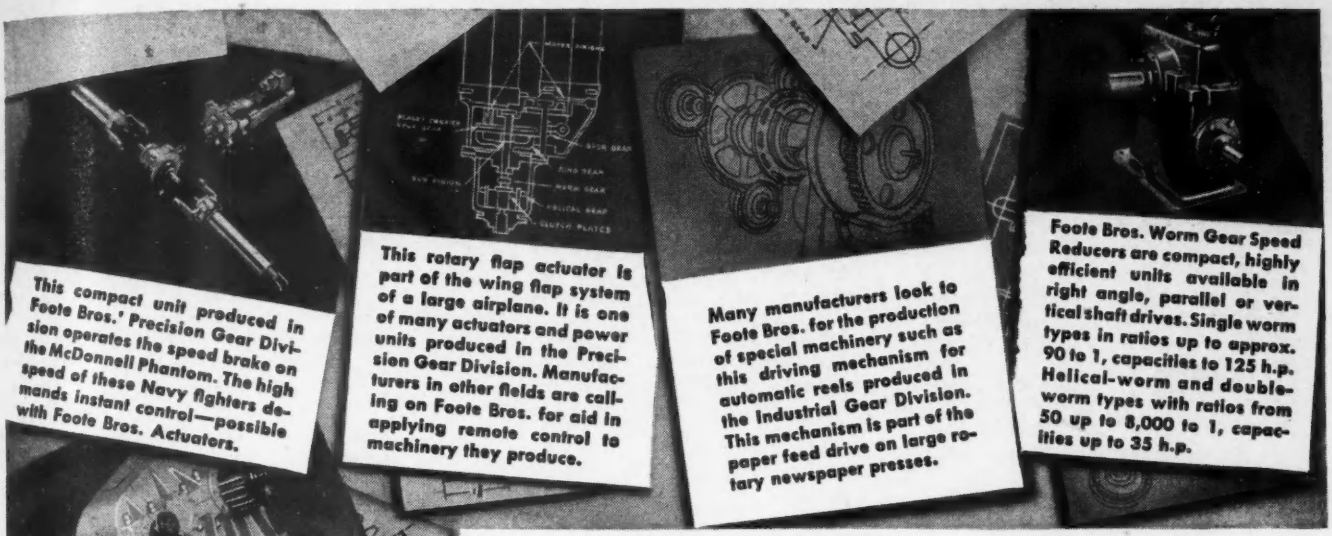
C-17—New Spring Tension Clamps

A new spring tension clamp has been developed by Aircraft Tools, Inc., Los Angeles, Calif.

Aircraft Tools spring tension clamps are said to be especally effective for skin, wood, plastic, or metal fabrication, template layout, and wherever uniform pressure and speed in applying and releasing are vital factors.

Applicable with either pliers or gun,

(*Turn to page* 72, *please*)



This compact unit produced in Foote Bros.' Precision Gear Division operates the speed brake on the McDonnell Phantom. The high speed of these Navy fighters demands instant control—possible with Foote Bros. Actuators.

This rotary flap actuator is part of the wing flap system of a large airplane. It is one of many actuators and power units produced in the Precision Gear Division. Manufacturers in other fields are calling on Foote Bros. for aid in applying remote control to machinery they produce.

Many manufacturers look to Foote Bros. for the production of special machinery such as this driving mechanism for automatic reels produced in the Industrial Gear Division. This mechanism is part of the paper feed drive on large rotary newspaper presses.

Foote Bros. Worm Gear Speed Reducers are compact, highly efficient units available in right angle, parallel or vertical shaft drives. Single worm types in ratios up to approx. 90 to 1, capacities to 125 h.p. Helical-worm and double-worm types with ratios from 50 up to 8,000 to 1, capacities up to 35 h.p.

Foote Bros. Helical Gear Speed Reducers are available in single reduction ratios up to 8.23 to 1, capacities up to 300 h.p.—double reduction ratios from 9.95 to 68.2 to 1, cap. to 200 h.p.—triple reduction ratios from 80 to approx. 300 to 1, cap. to 100 h.p.

Pages From An Engineer's Notebook

Shown here are a few of the many problems in power transmission that have been solved by Foote Bros.' Engineers. Look to Foote Bros. for the following equipment:

PRECISION GEARS that permit operation at extremely high speeds, assure maximum efficiency, compactness and low noise level, Foote Bros. "A-Q" Gears can be engineered to meet your toughest requirements.

POWER UNITS to fit any space envelope and to provide absolute control within an exact time cycle at any distance from the operator, Foote Bros.' experience can help you.

SPEED REDUCERS in a wide range of sizes and ratios to meet practically every industrial need, are also a part of Foote Bros.' line.

COMMERCIAL GEARS from 3 inches diameter up to 25 feet produced in any quantity—on a monthly delivery basis if desired.

In fact, no matter what your requirements in power control or transmission, the extensive facilities of Foote Bros.' two large plants, the skilled engineers, the three quarters of a century of experience back of this company assure your getting a satisfactory answer.

FOOTE BROS. GEAR AND MACHINE CORPORATION, Dept. F, 4545 S. Western Blvd., Chicago 9, Ill.

This internal ring gear is one of the many "A-Q" (aircraft quality) Gears produced by Foote Bros. These precision gears, providing the absolute minimum in weight, carry excessive loads at extremely high speeds. Their design and accuracy assure unusually efficient performance.

FOOTE BROS.

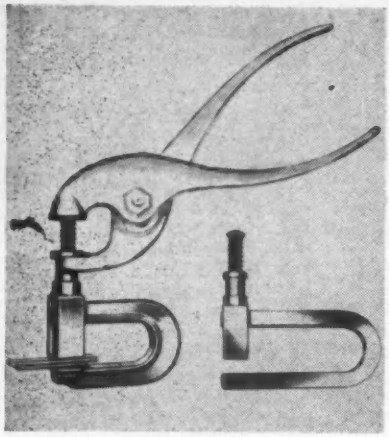
Better Power Transmission Through Better Gears

Spiral bevel gears are used extensively in aircraft because they transmit approximately 30% more power than straight bevel gears of corresponding size and weight. Foote Bros. produce spiral bevel gears in a wide range of sizes.

Spur, helical, worm or bevel gears to meet any production schedule . . . cast iron, steel, bronze or non-metallic in the following sizes:
Spur Gears, 16 D.P. to 4½ in. C.P. From 1 in. to 25 ft. Diam.
Helical Gears, 16 D.P. to 1½ in. D.P. From 1 in. to 98 in. Diam.
Worm Gears, 16 D.P. to 1 D.P. From 2½ in. to 144 in. Diam.
Bevel Gears, 16 D.P. to ½ D.P. From 1 in. to 100 in. Diam.

This complete gearing application was produced in the Industrial Gear Division of Foote Bros. for a manufacturer of locomotive turntables. It demonstrates the ability of this division to produce special machinery of all types for developing or transmitting power. Foote Bros. will help you with any equipment you are designing.

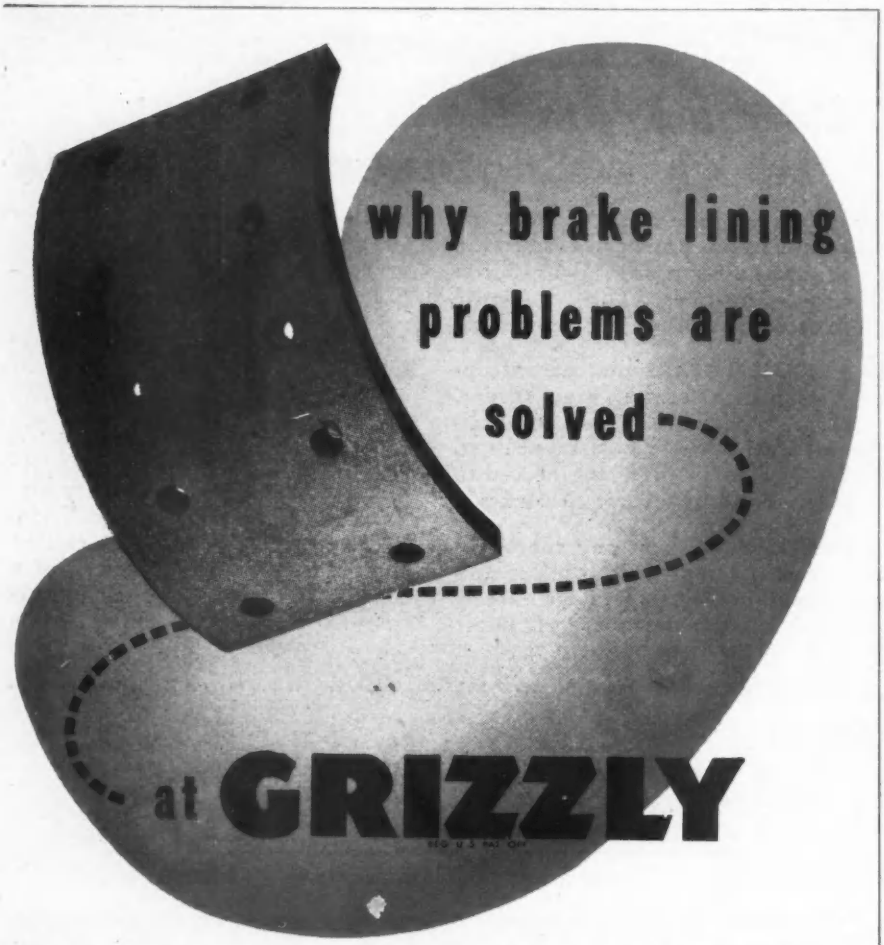
The complete facilities in Foote Bros. Industrial Gear Division include equipment for producing giant gears up to 25 feet in diameter. The spur gear shown here, for a cement mill, weighs 40,000 lbs. and has an 18-inch face, 4 inches C.P. Whatever you need in large gears call on Foote Bros.



Spring tension clamp made by Aircraft Tools, Inc.

one of the advantages of these spring tension clamps is the uniformity of pressure which they insure by eliminating the hand-tightening operation. Using a special steel spring, the clamp may be adjusted to secure up to 70 lb pressure. Pressure up to 100 lb may be had by the use of a special spring.

Aircraft's Tools' spring tension clamps are available in three standard sizes and may be ordered in special dimensions to fit job requirements.



Grizzly's more than 30 years manufacturing experience, constant laboratory research and alertness to new developments supply the "know-how" for successful solutions to countless brake lining problems of widely diversified natures.

Regardless of whether your problem is in the automotive or industrial field, Grizzly can be of assistance to you. Among production, engineering and purchasing men, Grizzly is recognized as one of the largest, most dependable producers of molded brake linings—added assurance that Grizzly has ample facilities to serve you.

Next time a brake lining problem confronts you, consult Grizzly.

GRIZZLY MANUFACTURING COMPANY
PAULDING, OHIO
PLANTS AT PAULDING AND BELL, CALIF.
Warehouse Stocks in Principal Cities

CALENDAR

Conventions and Meetings

Soc. of Automotive Engineers, Transportation Mtg., Chicago.....April 6-10
Chamber of Commerce of the United States, Annual Mtg., Washington, D. C. .....Apr. 28-May 1
Amer. Foundrymen's Association, Annual Convention, Detroit.Apr. 28-May 1
Soc. of Automotive Engineers, Personal Airplane Mtg., Wichita, Kansas, May 1-3
The Society of the Plastic Industry, Natl. Plastics Exhibition, Chicago, May 6-10
Soc. for Experimental Stress Analysis Annual Mtg., Chicago.....May 15-17
Nat'l Assoc. of Motor Bus Operators Annual Mtg., Chicago.....May 21-23
Amer. Soc. of Mechanical Engineers—Oil & Gas Power Nat'l Conference—Cleveland .....May 21-24
Auto. Engine Rebuilders Assoc. Convention, Detroit .....May 22-24
Mid-America Exposition, Cleveland—May 22-31
Amer. Soc. of Mechanical Engineers—Aviation Mtg., Los Angeles..May 26-29
Inst. of the Aeronautical Sciences Personal Aircraft Mtg., Detroit..May 26-27
Metal Powder Assoc., Spring Mtg., New York .....May 27
Soc. of Automotive Engineers—Summer Mtg. French Lick Springs, Ind..June 1-6
The National Federation of Sales Executives, Los Angeles .....June 2-4
Amer. Soc. of Mechanical Engineers—Semi-Annual Mtg., Chicago..June 16-19
Amer. Soc. of Testing Materials—Annual Mtg., Atlantic City.....June 16-20
Amer. Soc. of Mechanical Engineers—Applied Mechanics Div., Schenectady .....June 23-25
American Electroplating Society Detroit .....June 23-27
Institute of the Aeronautical Sciences, Annual Summer Mtg., Los Angeles, Aug. 7-8
Soc. of Automotive Engineers—West Coast Transportation & Maintenance Mtg., Los Angeles.....Aug. 21-23
Amer. Soc. of Mechanical Engineers—Fall Mtg., Salt Lake City.....Sept. 1-4
Amer. Soc. of Mechanical Engineers—Ind. Instruments & Regulators Div., Chicago .....Sept. 8-9
Instrument Society of America Conference, Chicago .....Sept. 8-12
Society of Automotive Engineers—Tractor Mtg., Milwaukee....Sept. 17-18
Natl. Machine Tool Builders Assoc. Machine Tool Show, Chicago, Sept. 17-26
Natl. Conference of Industrial Hydraulics, Chicago .....Oct. 16-17
Natl. Aircraft Show, Chicago .....Nov. 1-9

New Airplane Lifting Record—278,000 lb.

The Army Air Forces announced that its six-engine superbomber, the Consolidated-Vultee XB-36, set an unofficial world's record for airplane weight lifting in a recent test flight at Fort Worth, Tex. when it took off at a gross weight of 278,000 lb. This is the heaviest load ever lifted from the earth by a plane. The test flight lasted five hours, and the airplane weighed 130,581 lb; water ballast, 34,135; fuel, 79,380; oil, 6645; testing equipment, 25,259, and crew members and personal equipment, 2000.

Michigan WELDED STEEL TUBING

The Modern Electric Resistance Welded Steel Tube

✓ROUND
¼" to 4" O.D.
9 to 22 gauge

✓SQUARE
½" to 2" 20 gauge
1" to 2¾" 14, 16, 18 gauge

✓RECTANGULAR
½" to 2" 20 gauge
1" to 2¾" 14, 16, 18 gauge

Because it re-forms and machines so well, Michigan Welded Steel Tubing is widely used in the fabrication of production parts such as automobile exhaust and muffler tail pipes, gas tank filler tubes, steering jackets, and wherever bent and shaped tubes may be required. True concentricity, uniform I.D. and O.D. make it particularly economical when long runs are involved.

Michigan welded tubing can be:

FLANGED EXPANDED · FORGED SPUN · UPSET ROLLED · TAPERED BEADED · FLATTENED FLUTED

Engineering advice and technical help in the selection of tubing best suited to your needs. Address your inquiries to:

Michigan STEEL TUBE PRODUCTS CO.

More Than 30 Years in the Business

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FACTORIES: DETROIT, MICHIGAN • SHELBY, OHIO

DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

General News

(*Continued from page* 23)

More War Plane Production Demanded

Continuing failure to heed the warnings and recommendations of the official Air Coordinating Committee points up the need for Congressional action to establish a firm American aviation policy, Major General Oliver P. Echols, USA (Ret.), president of the Aircraft Industries Association, told the House Interstate and Foreign Commerce Committee recently. The committee is conducting hearings on a bill to establish a National Aviation Council.

General Echols pointed out that the official Air Coordinating Committee had recommended a minimum annual production of 3000 military planes only after maintenance of world peace is well assured and a substantial degree of disarmament has taken place. Actual production in 1946 was only 1330 military planes plus some 467 two and four engine transports possessing "reserve" value in a time of stress. This reduced level of procurement, the General said, is eroding the base for any future expansion to a point from which it will be impossible to achieve the required volume of production.

Agency to Establish Aviation Standards

The Aeronautical Board (joint Army-Navy planning organization) has designated the Aircraft Industries Association as the official coordinating agency in establishing standards for aeronautical parts, materials and processes. The Technical Service of AIA has developed a method of covering more than 400 U. S. manufacturers for the field of standardization. Among the trade and professional groups participating in the program are the Screw Industry Standards Committee, American Society of Refrigerating Engineers, American Association of Textile Chemists and Colorists, and the Society of Automotive Engineers.

Aviation Exports Almost $115 Million in '46

Nearly $115 million worth of aeronautical products were exported from the United States in 1946 according to the Office of International Trade, Department of Commerce. Included in the total were 2343 civil airplanes, valued at $64,200,000; 59 military airplanes, valued at slightly over one million dollars; 2490 aircraft engines, $11,800,000; aircraft engine parts and accessories, $12,855,000; and other parts and accessories, $17 million.

Pittsburgh Plate Glass Expands Duplate Capacity

Construction of a $385,000 addition to the Duplate Dept. at Pittsburgh Plate Glass Company's Creighton, Pa. plant will be started in April. Despite capacity production of Duplate, a laminated safety glass, Pittsburgh Plate Glass Co. has been unable to meet mounting demands of consumers, principally the automotive industry. Another decisive demand factor is that the areas of glass being used in the postwar car are constantly increasing.

Chrysler to Build If CPA Says Yes

If the expected authorization from the Civilian Production Administration comes through, Chrysler Corp. plans to start construction on April 22 of its three million dollar automobile and truck parts plant near Wilmington, Del. The plant will be built south of Newark, Del. along the Pennsylvania R. R. and will take about a year to complete.

(*Turn to page* 82, *please*)

(*Advertisement*)

Speeds Fabrication of Generator Frames by Automatic Arc Welding

A surprising variety of small automotive parts are now being fabricated with "Lincolnweld" automatic metallic shielded arc welding equipment. Speedier and lower-cost production and improved durability and appearance of the finished product are some of the advantages reported.

Superior Electric Company, Chicago, is using "Lincolnweld" to fabricate generator frames, producing 500 frames per hour with one "Lincolnweld" unit.

The generator frame is a 5/16" plate formed into cylindrical shape, leaving a gap which is fused by the welding process. In Fig. 1 the frame is shown before (left) and after welding.

The automatic welding process begins by inserting ten of the formed frames end to end in a special jig with the gaps facing upward. The gaps are closed to make a flush butt joint by tightening the bolts along the outside of the fixture with a wrench. Fig. 2 is a close-up showing one of the frames clamped in the jig before welding.

Fig. 2. Closeup of "Lincolnweld" head with one part in fixture. Actually 10 are welded at a time.

Fig. 3 is an overall view of the "Lincolnweld" set-up. The traveling unit consisting of welding head, wire reel, flux hopper and control box, is moved to one end of the travel beam on which it is mounted, the carriage is lowered to welding position and the entire unit moves from left to right along the beam under its own motor power.

As the carriage progresses, a granular flux is fed just ahead of the arc, completely covering it and protecting the molten weld metal from the atmosphere. It produces a dense, uniform bead of excellent quality. About 75 percent of the flux is recovered and screened for re-use.

Welding speed is 22 inches per minute, or approximately 10 frames welded per minute. Unloading and reloading the fixture takes about 1½ minutes. A single pass of bare wire electrode of 1/8" diameter is made with weld penetration of 75%. Current setting is 750 amperes and 32 volts.

Fig. 1. Generator frame.
Left: rolled, ready for welding. Right: welded.

"Lincolnweld" equipment is adaptable to all types of fabricating requirements. Two basic kinds of installations are used —head traveling while the work remains stationary, or head stationary while the work is rotated or moved by a suitable work-handling fixture. Lincoln engineers will assist manufacturers in studying possibilities for their products. Bulletin 439 describing the "Lincolnweld" process is available on request to The Lincoln Electric Company, Dept. 432, Cleveland 1, O.

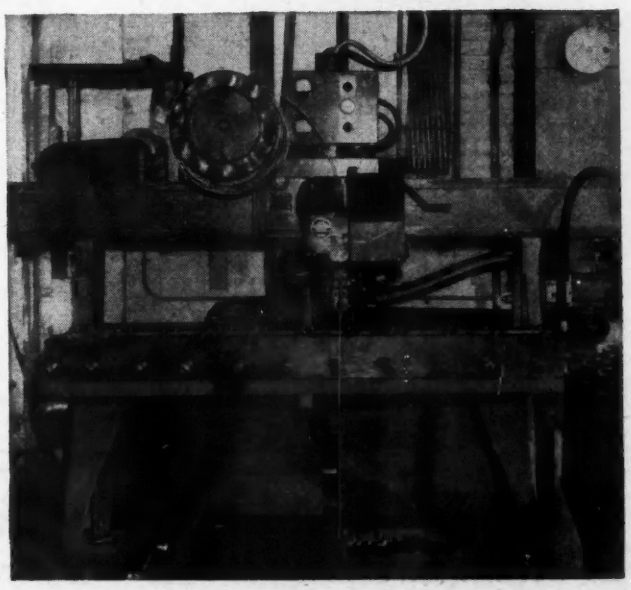


Fig. 3. General view of "Lincolnweld" equipment.

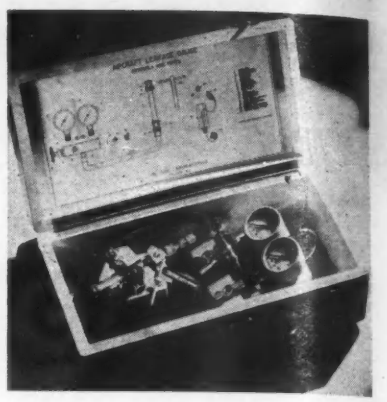
NEW Products for AIRCRAFT

(*Continued from page* 50)

the cylinder fitting inserted and expanded.

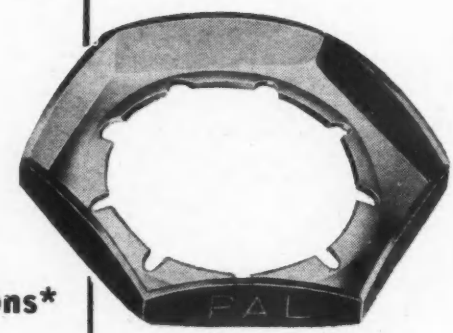
The regulator valve is adjusted until the left hand gage indicates "set-point" and the right hand gage indicates leakage. Alternate scales indicate cu ft per min.

Furnished with the leakage gage is the "checker" by which the accuracy of gage may be proved at any time. This comprises a calibrated orifice or standard leak to which the leakage gage is connected as to a cylinder. When set as for cylinder testing, right hand gage must read 60 psi, plus or minus 2 lb.



Cities Service leakage gage

Why PALNUT LOCKNUTS are used on tough automotive applications*



The Assembly Stays Tight!

"Palnut" double-locking action is unaffected by vibration — holds regular nut to original tightness.

•

The Cost Is Low!

"Palnut", plus regular nut, costs less than most other locknuts and nut-and-lock combinations.

•

The Application Is Easy!

"Palnuts" spin on bolt freely, lock tight with 1/3 turn of wrench.

*USED ON: Connecting Rods, Brake Parts, Exhaust Manifolds, Body Hold Down, front and rear engine mountings and many other applications.

Send details of assembly for samples and data

THE PALNUT COMPANY

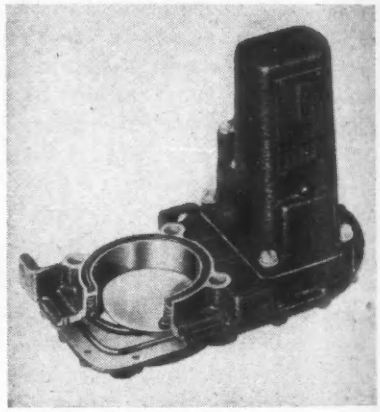
60 Cordier Street Irvington 11, N. J.

Detroit Office: 3-213 General Motors Building

C-6—Motor-Operated Shut-Off Valves

A new series of motor-operated shut-off valves for aircraft, has been brought out by the Wm. H. Whittaker Co., 915 N. Citrus Ave., Los Angeles, Calif.

Several new features have been incorporated in the design of the Whittaker motor-operated shut-off



Whittaker aircraft valve

valve. Among these is the Whittaker fluid seal. This synthetic ring-type seal is said to insure positive leakproof performance under pressures up to 200 psi and temperatures of —65 to 450 F. Powered by a small, explosion-proof motor, Whittaker electrically operated valves are available with operating times of 1 to 60 seconds.

Manufactured to accommodate in a wide variety of AN pipe sizes and tubing connections, Whittaker motor-operated valves are adaptable to fuel, oil, water, air or vacuum lines.

C-7—Cabin Heater Testing Machine

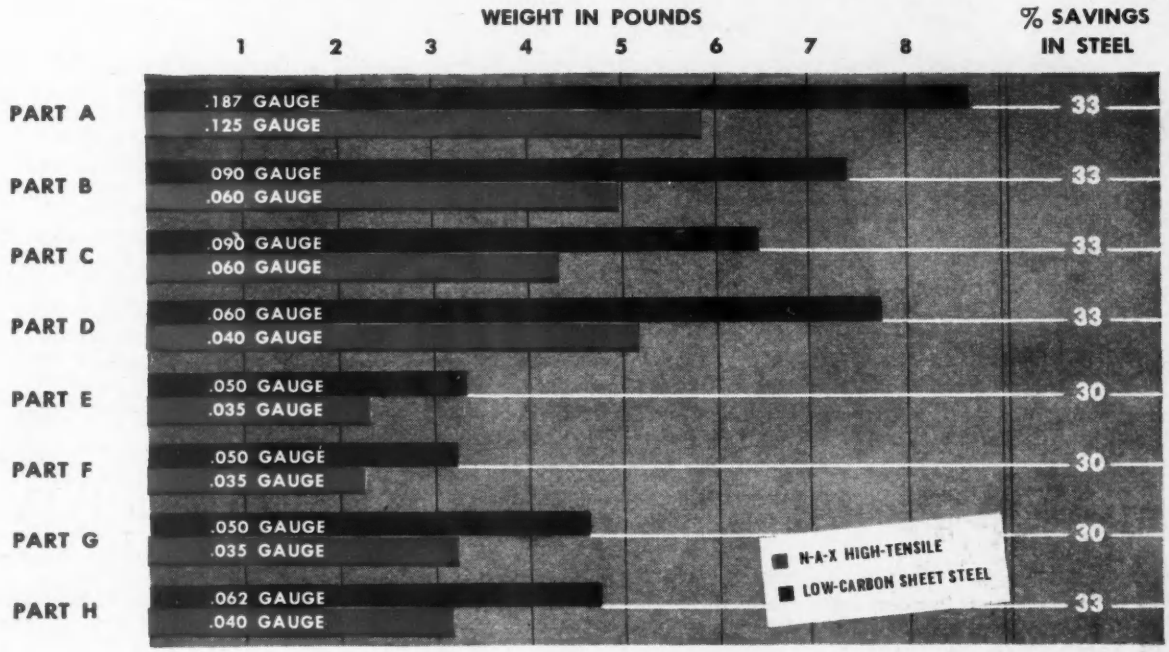
The cabin heater test machine, Model JH-1, was designed by Greer Hy-

(*Turn to page* 78, *please*)

THE NEW ARITHMETIC IN STEEL

ACTUAL PRODUCTION FIGURES MORE THAN PROVE IT:

3 TONS N-A-X HIGH-TENSILE > 4 TONS CARBON SHEET STEEL



We have claimed that N-A-X HIGH-TENSILE can effect a 25% saving in steel. This graph shows the results when one leading manufacturer switched from carbon steel sheets to N-A-X HIGH-TENSILE . . . utilized thinner sections with no sacrifice of strength . . . and saved up to 33% in steel.

The change was made because of the unique combination of properties of N-A-X HIGH-TENSILE. With its 50% higher physical properties, it has exceptional formability for a high-strength steel, and can be formed and drawn into intricate shapes with little or no change in dies or machinery adjustments. It has excellent weldability, great impact toughness, high fatigue- and corrosion-resistance. These qualities not only provide a more durable product, but often effect economies in fabricating and handling. Based on *over-all costs,* N-A-X HIGH-TENSILE compares favorably with carbon sheet steel.

Today's supply of N-A-X HIGH-TENSILE is insufficient to meet the demand, but we are looking forward to the day when we can fill your needs. When that time comes, our engineers and metallurgists will be glad to work with you to determine just how much steel you can save by using N-A-X HIGH-TENSILE.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N-A-X
HIGH-TENSILE STEEL

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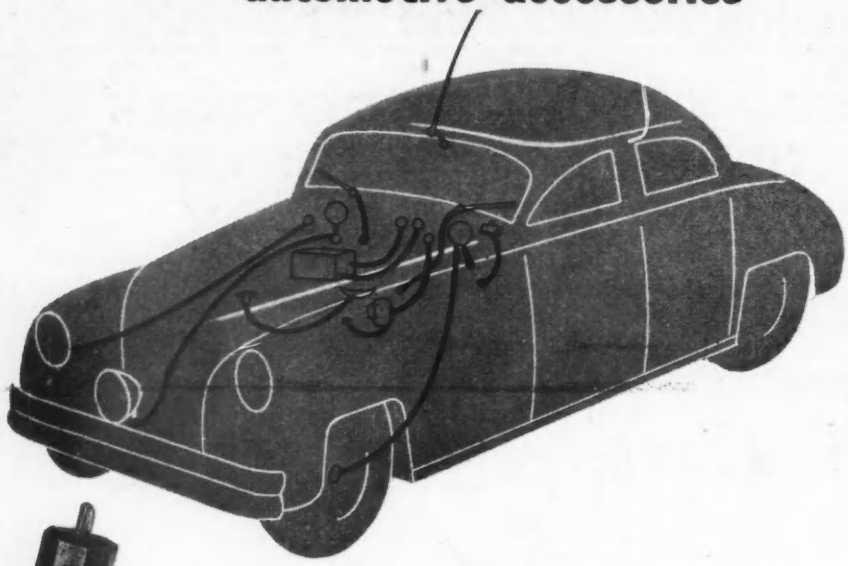
GREAT LAKES STEEL
Corporation
N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

S.S.WHITE METAL MUSCLES*

for powering or controlling automotive accessories



S.S.White Flexible Shafts are the metal muscles that make it a simple matter to deliver rotational power to any point in a car, truck, bus or other motor vehicle—or to extend rotary remote control from any point in the vehicle to any other point.

For any accessory that needs driving, a simple flexible shaft take-off from the transmission or other power points will permit the accessory to be placed wherever desirable. Windshield wiper and speedometer are examples.

For any accessory that needs remote control, such as the radio, heater, air conditioner, etc., an S.S.White remote control type flexible shaft is the answer. It's easy to install out of the way all the way and gives smooth, sensitive control between any two points.

Remember these "Metal Muscles"* when you do any automotive designing.

WRITE FOR THIS 260-PAGE FLEXIBLE SHAFT HANDBOOK

It gives complete information and technical data about flexible shafts and how to apply them. A copy will be mailed free, if you write for it direct to us on your business letterhead and mention your position.

*Trademark Reg. U. S. Pat. Off. and elsewhere

S.S.WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO.
DEPT. A, 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
MOLDED RESISTORS • PLASTIC SPECIALTIES • CONTRACT PLASTICS MOLDING

One of America's AAAA Industrial Enterprises

PACIFIC COAST REPRESENTATIVE — F. W. STEWART MFG. CORP.
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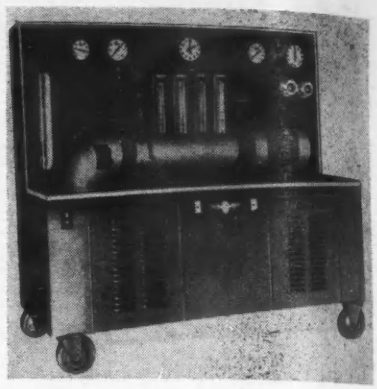


Greer Model JH-1 test machine

draulics, Inc., 454 18 St., Brooklyn 15, N. Y., to meet the need for a suitable test unit for aircraft heaters. The machine is a self-contained unit and is fully equipped to rapidly and accurately test aircraft heaters to manufacturers test specifications. The unit is said to be fully explosion and fireproof. Some of the features of this machine are: Ample capacity up to 1000 cfm air flow at 12 in. of water at 70 F and 1800 rpm; it is provided with adapters to permit mounting the various models of heaters; temperature and pressure indication by gages and manometers accurate to 2 per cent; pressure feed system to simulate actual operating conditions.

Replica Techniques

(*Continued from page* 37)

negative replica film is cut into one-in. squares that are mounted replica side up over a 0.625 in. diam hole punched in a specimen holder made of thin brass plate. The edges of the film are cemented to the specimen holder with some of the lacquer. The negative replica film contracts to a flat surface as the cementing lacquer dries. A glass plate is placed in contact with the back of the specimen holder; and both are placed in a high-vacuum metal-evaporation unit where an opaque coating of silver is evaporated onto the replica side of the film.

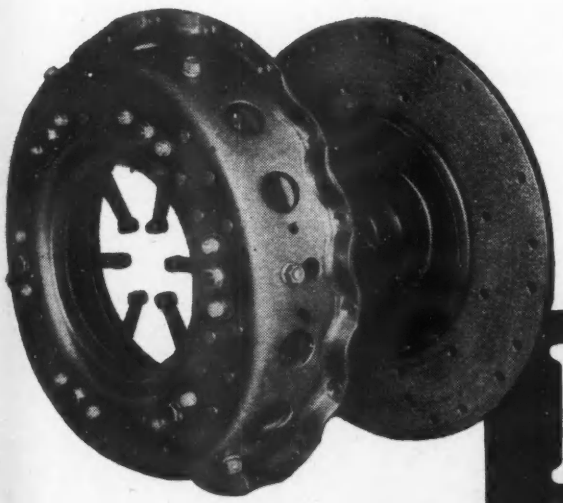
The replica then may be examined microscopically by viewing the opaque silver coating through the lacquer film. The surface thus seen is a positive replica of the original metal surface. If permanent microscope-slide mounts are desired, a 0.50 in. diam disk may be cut from the center of the positive replica and mounted silver side down on a microscope slide previously dipped in a fresh warm 10 per cent water solution of gelatin. The slide should be allowed to dry for at least 12 hr. If the negative replice film is dirty, wrinkled or otherwise unsatisfactory, it may be dissolved from the slide with acetone and a new film of the lacquer applied. The silver replica remains fastened to the gelatin during the process.

Proves its Quality in STOP-and-GO Driving

Long heavy-duty clutches are built for exacting commercial driving—yet respond to easy pedal-pressure with instant, *positive* action.

Since 1922, Long clutches have been standard equipment on millions of cars, trucks, buses and tractors.

LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
DETROIT 12, and WINDSOR, ONT.



LONG

CLUTCHES • RADIATORS • OIL COOLERS

MAKE 1947 PRODUCTS ON 1947 PRESSES

Speed, power, streamlining, are the features that distinguish modern automobiles . . . and modern presses.

Put the same efficiency into your production line that is engineered into your products . . . Designed for maximum utility, Danly presses have the mechanical accuracy and rugged construction that make for faster runs, more accurate stampings, longer die life, less downtime, and *greater production.* Enclosed construction saves floor space, lessens safety hazards—especially in rows or batteries.

Bring your production equipment in step with the products you manufacture. *Make 1947 Products on 1947 Presses.*

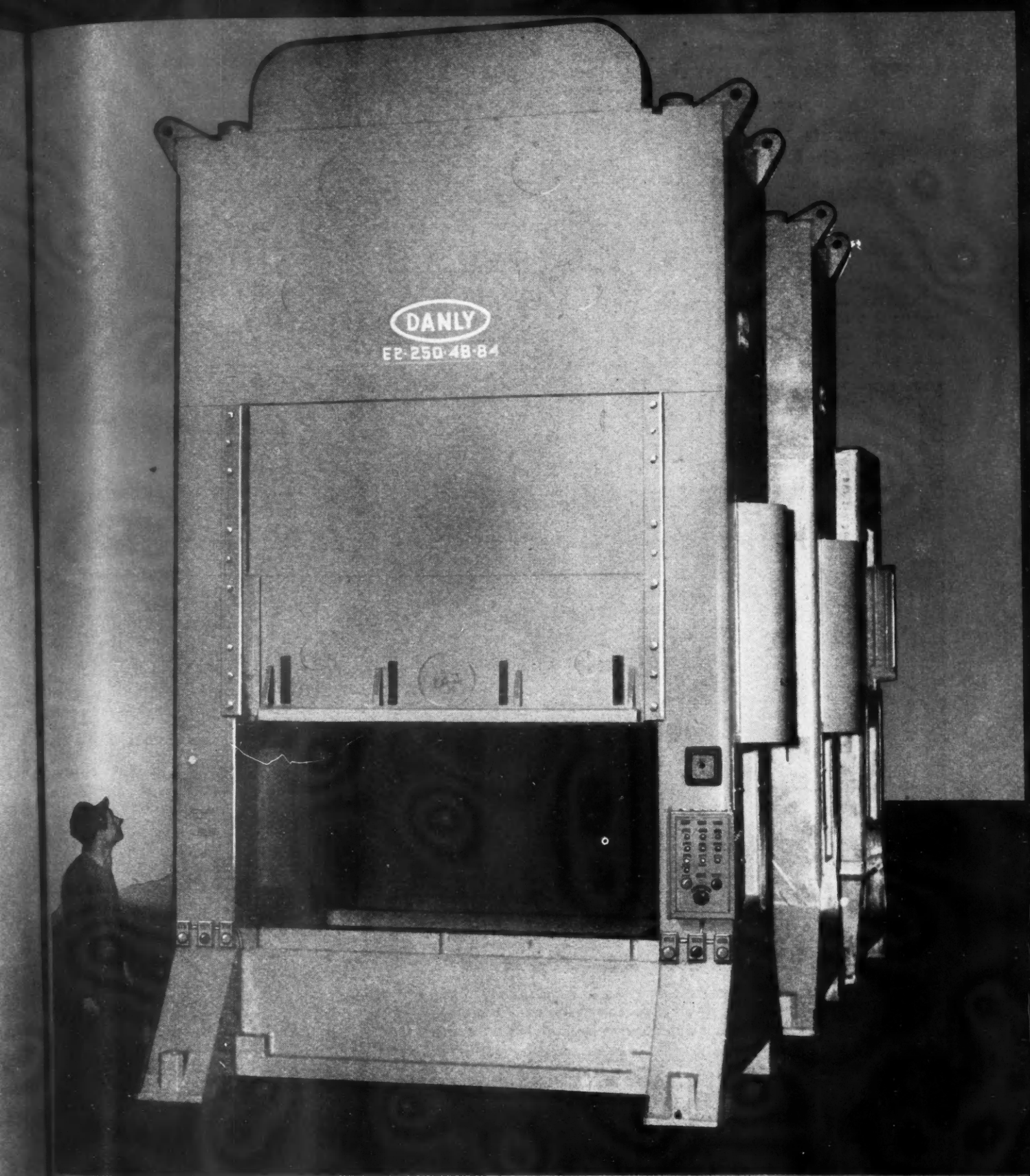
STEEL UNIT FRAMES

Danly Open Back Inclinable and Horning presses have unit frames of rugged one-piece all-steel construction. The frames, massive for presses of this type and size, lend great rigidity and resistance to deflection to these presses. Gears and driving members completely enclosed within the frame run in a spray of filtered oil.

Unusually long gibbing and two slide connections make for even pressure along the full length of the stroke—insure accurate alignment on large or progressive dies—prevent eventual loosening up or slide play due to uneven loads.

Danly O.B.I. and Horning presses range from 50 to 200 tons pressure in both single and two-point models.

DANLY
The Press for Modern Production



These double geared presses are typical of Danly's complete line of one, two and four point straight-side presses. Pressures range from 100 tons up. Special sizes and types engineered to specifications.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue
Chicago 50, Illinois

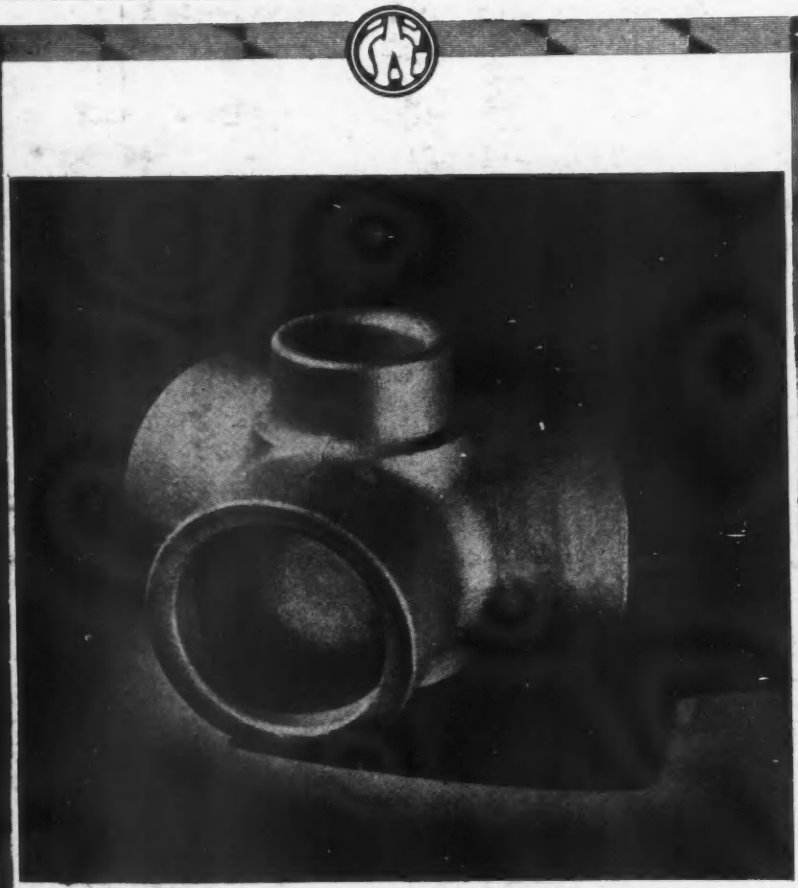
General News

(*Continued from page 74*)

Council Wants Helicopters in Cities

Helicopters will perform their growing transportation services with a maximum of safety and a minimum of noise, federal, state and local aviation authorities have been assured by the Helicopter Council of the Aircraft Industries Association.

Pointing out that the utility of the helicopter can be developed to the fullest extent only by adjusting existing regulations to take advantage of the helicopter's unusually safe and useful flight characteristics, the Helicopter Council urged that existing regulations be adapted to permit operation of helicopters in urban areas. Assurances of safety are contained in a "Statement of Policy" prepared by the Helicopter Council and presented to Assistant Secretary of Commerce for Air, William A. M. Burden; CAB Chairman James M. Landis, and CAA Administrator, T. P. Wright. The presentation was made by Lawrence D. Bell, Chairman of the Helicopter Council and president of the Bell Aircraft Corp.



Just a forging, but—the forging process develops the greatest combination of physical properties (tensile and compressive strength, ductility, impact and fatigue strength) and the greatest uniformity of quality of any method of manufacturing metallic shapes. . . . Wyman-Gordon has pioneered in the development of intricate forgings typical of which is the one-piece propeller hub illustrated here.

Standard of the Industry for Sixty Years

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS - DETROIT, MICHIGAN

Versatile British Medium Aircraft

A new twin-engined British medium airplane, the Percival Prince, has a cabin, with 6 ft of headroom, that can carry as many as 10 passengers. It can be adapted as a freighter with an useful load of 3260 lb or both passengers and freight can be carried. Furthermore, provision is made for the attachment of either wheels, floats or skis.

The all-metal Prince is powered by two 505-hp Alvis Leonides radial air-cooled engines, driving constant speed, feathering and braking propellers with provisions for blade deicing. A cruising speed of more than 170 mph is estimated; the top speed is 206 mph and the range 800 miles. Its overall length is 39 ft 7 in., span 56 ft, height 14 ft 3 in. and gross weight 9600 lb.

SAE to Discuss Small Planes

Aeronautical enginers have been invited by the Society of Automotive Engineers to convene at Wichita, Kan., May 1 and 2 for the SAE National Personal Aircraft Meeting and discussion of the technical requirements of small planes for private operation. More than a dozen technical papers, to be presented at five discussional sessions, will cover engineering features both of small aircraft and helicopters. The sessions will conclude with a dinner at which SAE President C. E. Frudden, of Milwaukee, Wis., will speak and W. B. Stout, of Detroit, Mich., will discuss "A New Approach to the Flight Problem."

Westinghouse to Build Lamp Plant

The Westinghouse Electric Corp. has selected Richmond, Ky., as the site for a new plant to manufacture miniature lamps for automobiles, flashlights, radio panels, etc. An option has been taken to purchase a 13-acre property on the northern edge of Richmond. Present plans call for the erection of a one-story "L" shaped brick and steel, fire resistant manufacturing plant with total floor space of about 75,000 sq. ft.

ICC Rules on Driveaways

In ruling that automobile driveaway operators may not transport more than one vehicle by the saddle-mount method and that a full-mounted vehicle may not be carried on a vehicle towed by the single saddle-mount method, Division 5 of the Interstate Commerce Commission also rewrote the safety regulations gov-

(*Turn to page 84, please*)

Established SEALING PRACTICE

AXLE SHAFTS

TRANSMISSION SHAFTS

PINION BEARINGS

FAN SHAFT

PUMP SHAFT

WHEELS

STEERING MECHANISMS

TO RETAIN LUBRICANTS

TO EXCLUDE FOREIGN MATTER

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SIRVENE SYNTHETIC RUBBER

CHICAGO RAWHIDE MANUFACTURING CO.

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67 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY AND NOW SIRVENE SYNTHETIC PRODUCTS

erning driveaway operations. Effective April 1, the order also covered the following points: Correction of brake deficiencies; a provision that tow-bars shall have adequate strength; and a provision that tow-bars may be attached to bumpers of new vehicles only. Other changes are designed to secure the structural adequacy and to assure the proper functioning of tow-bars and single saddle-mounts. Still other are designed to promote safety in driveaway operations and apply more particularly to methods operations than to details of design and construction.

Int'l Organization For Standardization

The International Organization for Standardization set up provisionally at a meeting of 25 nations in London last October, has become the official body for international standardization work following ratification of its constitution and by-laws by the national standards bodies of 15 nations. The United States, which was the first country to ratify the convention setting up the new organization through approval of the American Standards Association, has now been joined by the following 14 countries: Chile, Brazil, Australia, Mexico, Finland, France, Switzerland, China, Austria, United Kingdom, Sweden, India, Czechoslovakia and Denmark.

X-Ray Standards for Airplane Makers

The development of X-ray acceptance and rejection standards has been requested by some airplane makers in association with Wright Field officials. A beryllium copper alloy procedure is now in the works, and development of X-ray standards for other metals is planned.

Italians Building 5-Cylinder Diesel

The Italian factory, Lancia, Ltd., of Turin, has produced since 1938 a five-cylinder in-line Diesel engine known as type 102. This engine has a 4.25 in. bore, 5.91 in stroke, and develops 92 hp at 1860 rpm. It is used for the Lancia 3 RO heavy truck. Another engine of similar type is built by English Gardner, Ltd., for use in highway vehicles.

B. F. Goodrich Plans $1 Million Expansion

The B. F. Goodrich Co. is spending $1 million to expand the tire manufacturing facilities of its Miami, Okla. plant. The expenditure is earmarked for new equipment to be installed by July 1, and which, it is expected, will result in a production boost of 16 per cent over current output.

LIGHT PEDAL PRESSURE
CUSHIONED ENGAGEMENT
VIBRATION DAMPENING
ACCURATE BALANCE
DIRT EXCLUSION
HEAT DISSIPATION
LIFETIME ADJUSTMENT

* All ROCKFORD Spring Loaded CLUTCH plates not only are carefully checked for accuracy of dimensions but are inspected on a rotary static balancing machine. Uniform operation, minimum wear, less-frequent adjustment and long life qualities of ROCKFORD Spring Loaded CLUTCHES thus are protected during production.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

Obituaries

Thomas O. Duggan

Thomas O. Duggan, 52, for many years vice president of Thompson Products, Inc. and lately a partner in Hockaday & Phillips, Inc. of Los Angeles died March 20, 1947, in Orange, Cal.

Roland F. Benzinger

Roland F. Benzinger, 55, president of The Electric Furnace Co., Salem, Ohio, died on March 25, 1947 at Salem after an extended illness.

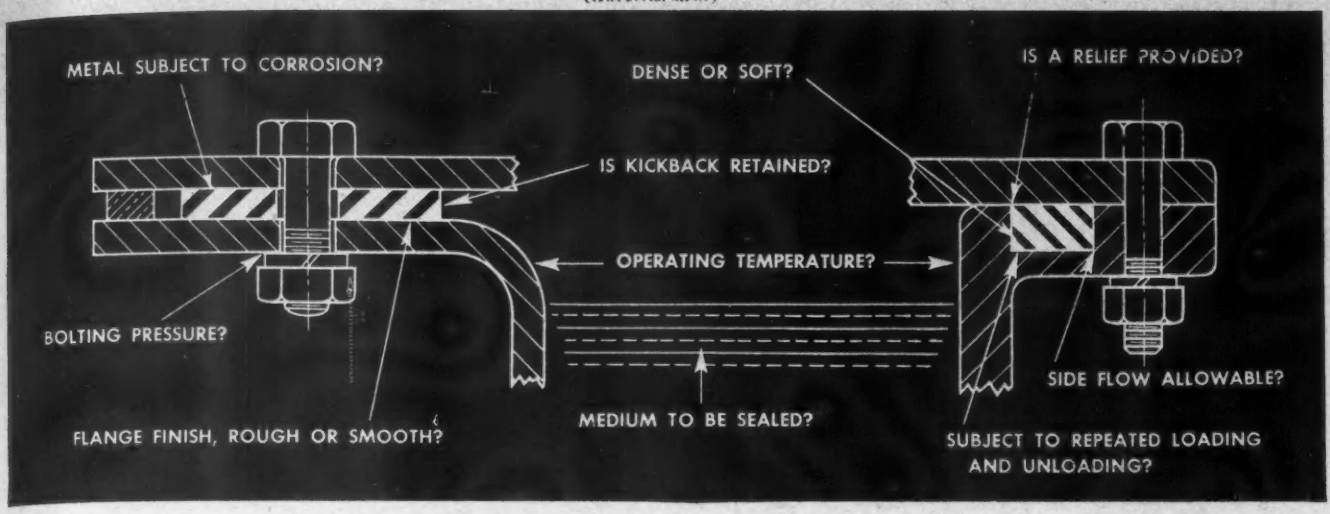
Charles A. Erickson

Charles A. Erickson, 69, sales engineer for the United Specialties Co., died on March 15, 1947 at Dearborn, Mich., following a sudden illness.

Clay L. Reely

Clay L. Reely, 60, vice president of Fuller & Smith & Ross, Inc. and president of the Cleveland Advertising Club, died on March 26, 1947 in Cleveland.

(Advertisement)



FACTORS IN CHOOSING RESILIENT GASKETS

Final selection speeded by analyzing operating conditions, material characteristics

Once a good flange or joint design has been developed, there remains the problem of choosing a specific gasket material. A review of the principal factors to be considered can help narrow the range of possible choices and speed final selection.

TEMPERATURE. Temperatures in excess of 250° F. immediately eliminate most resilient gasketing materials. Where temperatures fluctuate, an average figure may be used as the upper limit. Surges to temperatures in excess of 250° ordinarily are not fatal if they are infrequent and of short duration.

INTERNAL PRESSURE. When internal pressures are high, a tough, non-porous material should be used. Gaskets normally should be as thin as flange surfaces will permit. In addition, special groove or flange design may be required.

MEDIUM TO BE SEALED. When a gas or fluid must be sealed, its effect on the gasket must be determined. For example, a gasket may be made ineffective by a fluid that partially dissolves it or brings out certain extractables. Some fluids may harden a gasket or otherwise affect its aging qualities. As a further example, the presence of steam, acids, or alkalies will eliminate certain resilient materials. On the other hand, the fluid itself may be contaminated by elements dissolved out of a gasket.

Along with a consideration of operating conditions must go an appraisal of the various gasketing materials and their characteristics.

COMPRESSIBILITY. A soft, highly compressible material is required for semi-finished or irregular surfaces, such as stamped flanges, and joints where only light bolting pressures are available. Such a material is needed also in confined application where no side flow is allowable. Harder, less compressible materials normally should be used on heavy, smooth flanges that provide substantial bolting pressure.

KICKBACK. Closely related to compressibility is kickback, the ability of a material to maintain effective pressure against sealed surfaces. Retention of kickback is essential to a lasting, tight seal. Accordingly, the reaction of each possible material to the operating conditions must be known and also its behavior under repeated loadings and unloadings, if such usage is involved. Continuous loading will, of course, produce a permanent set in most resilient materials. A good gasket material, however, will reach a point of equilibrium in this respect and still retain enough kickback to insure a tight seal.

CORROSIVE PROPERTIES. Where corrosion enters, as when sealing any of the light metals, gasket materials treated to prevent undesirable reactions or compounded especially for this service must be used.

* * *

Since so many variables influence the choice of a gasket material, we recommend that you discuss your particular application with an Armstrong representative before you set up a specification. He will be glad to suggest suitable materials and supply samples for testing. Call or write the district office nearest you.

If you prefer, send drawings and details to us for review. You will find our recommendations unbiased and keyed to good current gasketing practice. There's no obligation, of course.

SEND FOR FREE BOOKLET.

For specification and application data on Armstrong's more than 50 resilient sealing materials, send for a free copy of the latest edition of "Gaskets, Packings, and Seals," twelve pages of helpful information. Address Armstrong Cork Company, Gaskets and Packings Department, 1504 Arch Street, Lancaster, Penna.

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Cork Compositions • Cork-and-Synthetic-Rubber Compositions
Synthetic Rubber Compounds • Cork-and-Rubber Compositions
Fiber Sheet Packings • Rag Felt Papers • Natural Cork

New Production and Plant EQUIPMENT

(*Continued from page* 48)

travel in a vertical plane or in any tilted plane up to 15 deg off-vertical. Ram cutting and return stroke speeds are infinitely adjustable over a wide range to take advantage of all work conditions. Because the ram is hydraulically driven, stroke lengths are easily set by valve control exactly as required.

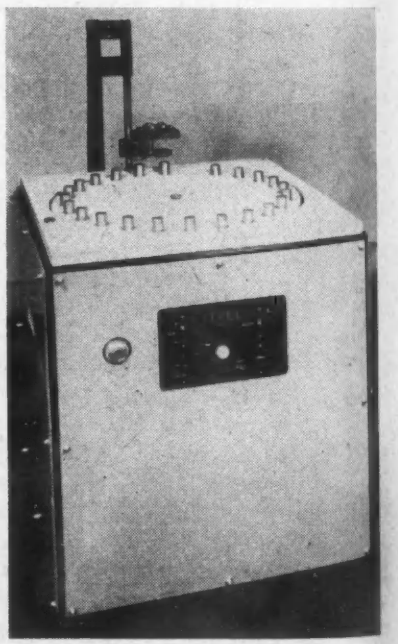
Column location of the push-button panel centralizes all electrical and hydraulic controls. "Inching movement" of the ram is provided with control at the push-button panel. As in all Hy-Draulic slotters, the table provides three types of work feed-rotary, transverse and longitudinal. For manual table operation during set-up, gear ratios afford easy table movement.

B-9—Indexing Table for Small Parts

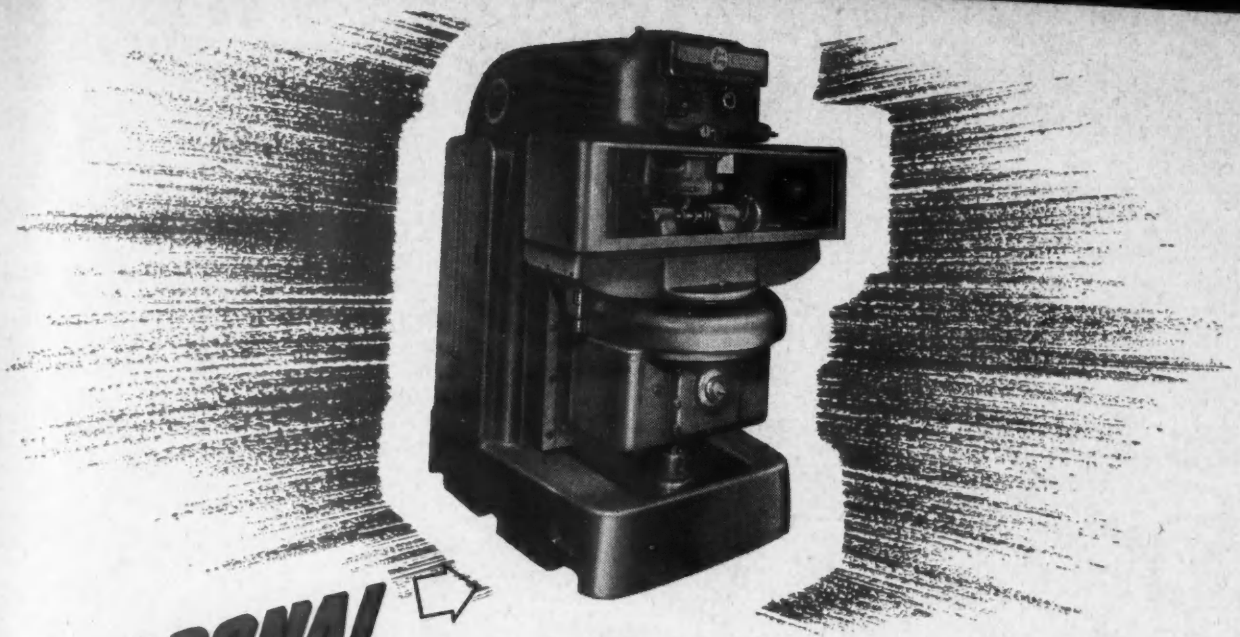
A new indexing table, for use in soldering, brazing, and annealing of round or irregularly-shaped small parts, is now in production at Lepel High Frequency Laboratories, Inc., 39 W. 60 St., New York, N. Y. This unit has been developed particularly for heating of parts where shape or control of heat requires closer or more accurate coupling than can be achieved by moving the parts through a tunnel-type coil.

Parts on the table are moved or indexed into heating position, the load

(*Turn to page* 88, *please*)



Lepel indexing table



A DIAGONAL GEAR SHAVING MACHINE FOR HIGH PRODUCTION

The new Red Ring Model GCU Diagonal Shaving Machine has been developed especially for mass production. While the principle of Rotary Crossed Axes shaving which has proved itself over the years is retained, an entirely new method of its application provides a number of advantages in production operations. Some of these are:

1. **Greater stock removal on each cutting stroke.**
2. **Reduced time for each cutting cycle.**
3. **Complete cutting cycle just two passes under cutter.**
4. **Cutter life materially extended.**
5. **Cutter cost greatly reduced in many cases.**
6. **No special cutters required.**
7. **Better control of lead angle on helicals.**
8. **Operator fatigue reduced.**
9. **Oversize gears automatically screened out.**
10. **Operator's haste cannot jeopardize tooth surfaces.**
11. **Amount of crown on Elliptiod teeth can be varied.**

For full details write for bulletin.

2523

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

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SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

(*Continued from page* 86)

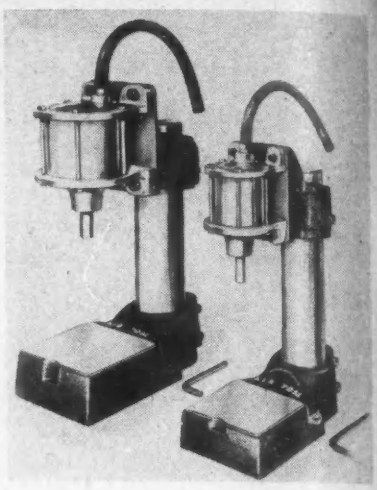
coil lowers to surround the part, and the heating cycle is carried out, all automatically. Length of the heating cycle can be varied to meet any requirements by an adjustable timer, and the index speed adjusted by changes in the variable speed drive. Upward and downward travel of the load coil is normally 3½ in. but can be changed to meet requirements.

The new table can be used in conjunction with any Lepel high-frequency converter or other high-frequency generator, and comes equipped with a built-in automatic timer which controls the heating time of the part. This automatic timer also controls the power of the converter, turning it on and off simultaneously with the downward and upward stroke of the load coil.

The slip-on-the-transmission-shaft feature which permits both MECHANICS Roller Bearing UNIVERSAL JOINTS to be welded to the tubular shaft, reduces runout, lost motion, excessive play and whip to a minimum. Let our engineers show you how this and other MECHANICS features will help give your product competitive advantages.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner
2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

B-11—Two New Air Arbor Presses

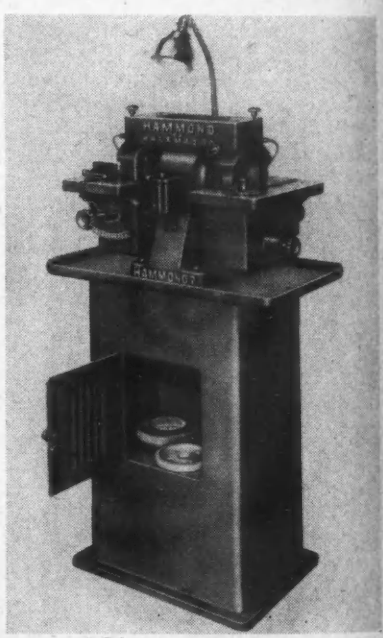


Air-Trol arbor presses

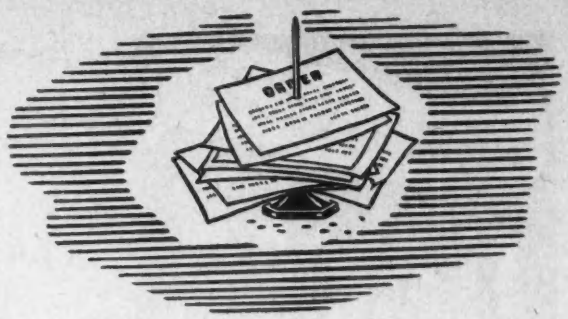
To supplement its line of spring return air cylinders for the application of air power to material holding operations, Air-Trol, 2653 W. Lake St., Chicago 12,

(*Turn to page* 90, *please*)

B-12—Hammond Model 7 Carbide Tool Grinder



This new Hammond tool grinder will accommodate either six-in. or seven-in. diameter wheels. The spindle and bearings are oversize, and one of the bearings is double row for taking end thrust. Tables are eight in. by 14 in. and may be set to any angle from 25 deg above to 30 deg below horizontal. The motor is ½-hp, 3450 rpm, 220 or 440-3-60, or 110-1-60. The Model 7 carbide tool grinder is made by Hammond Machinery Builders, Inc., Kalamazoo 54, Mich.

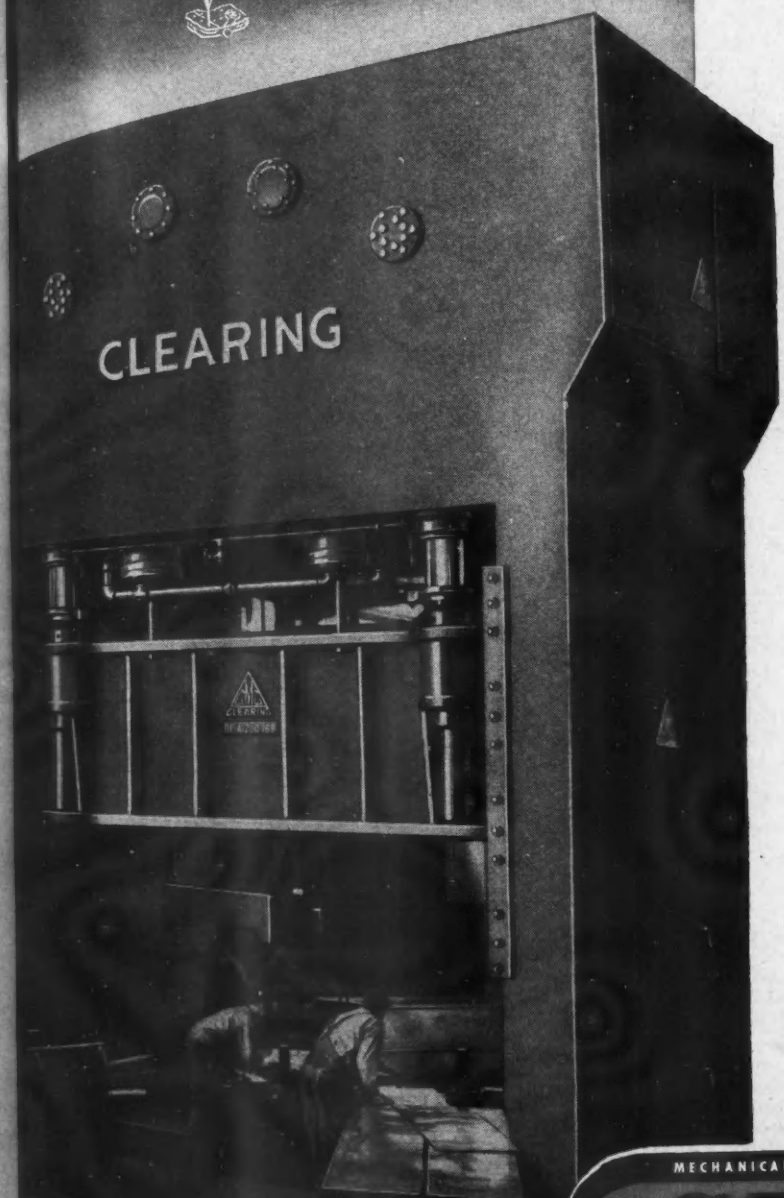


One Press for Many Jobs —and PROFIT Every Time

Ability to "earn its keep" in a job shop is a severe test of the versatility of any equipment, and especially so of larger machinery like this 1200-ton double-action Clearing press. Yet this ability to handle a wide variety of work, all on a sharpened-pencil basis, and produce a profit doing it, is often the factor which determines whether a press should be purchased.

The design and construction of Clearing presses merit special attention when consideration is given to varied possible uses. For example, the inner slide of the press shown here has a 42″ stroke, long enough for any likely need. Despite this unusual length of stroke, the slide is held parallel to the bed by the exclusive Clearing practice of plunger guiding in the crown in addition to the extra long adjustable gibs. Precise position is therefore maintained at every point of the working stroke regardless of its length.

The precision and the flexibility resulting from Clearing design and craftsmanship are thus further assurance of profitable operations, now and in the future, when you put your press problems up to Clearing. There is no cost, no obligation involved when you consult our engineers.



SPECIFICATIONS

Capacity: Inner slide 700 tons
Outer slide 500 tons
Stroke: Inner slide 42″
Outer slide 36″
Strokes per minute: 4 and 3
Bed Area: 100″ x 168″
Die cushion equipment: 138 tons at 100 lbs. air pressure

MECHANICAL AND HYDRAULIC PRESSES ★ 45 TONS CAPACITY AND LARGER

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● Abrasion, gouges and other scars of long useful service do not affect HAVEG'S high resistance to a long list of corrosive agents.

Tanks, towers, and other large, structurally strong equipment can be molded in one piece at nominal cost. And because the Haveg process is extremely adaptable, many complicated and non-standard items offer minimum manufacturing difficulties with a consequent saving in your investment.

Haveg Bulletin F-4 gives complete information on corrosion resistance, physical properties, structural details and other engineering data. Send for it today.

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New Production and Plant EQUIPMENT

(*Continued from page* 88)

Ill., is featuring two new air arbor presses which combine the features of both arbor and kick type equipment.

One is a heavy duty model that weighs 72 lb and delivers well over a ¾ ton squeeze at 150 psi line pressure.

The smaller model weighs 40 lb and delivers approximately ¼ ton at 150 psi line pressure.

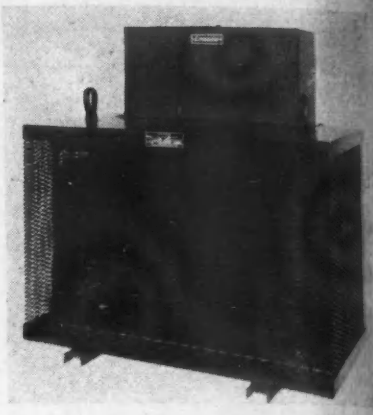
These units, when applied to arbor or kick type press operations, can be set by regulating the air line pressure to give uniform pressure on each application, assuring "just enough" effort to do the job without danger of crushing, or of incurring variable pressures due to unregulated manual control.

Either model, where operated with foot valve control, delivers a full stroke with less than one in. of foot movement. leaving both hands free for work handling.

The cylinder brackets are fully adjustable on the columns to give a working range, or ram clearance, of 0 to 6 in. over the table.

B-12—Air Cooled Transformers

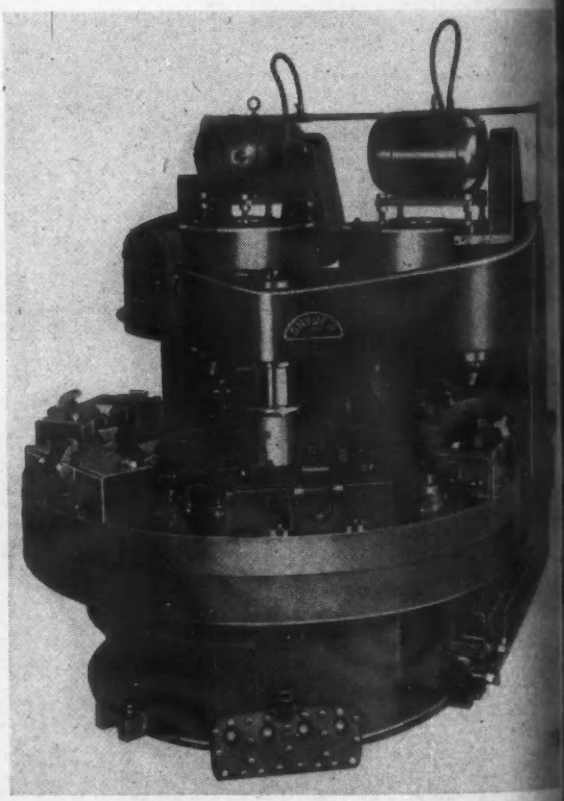
Lindberg Engineering Co., 2444 W. Hubbard St., Chicago, Ill., is now manufacturing a complete line of air cooled transformers. These transformers have been developed for use with electric furnaces, for testing functions, and various applications requiring heavy current.



Lindberg 50 kva transformer

The Lindberg line of transformers features a built-in wiring compartment and terminal board. This feature has been engineered to facilitate ease of installation. Tap switches to handle up to 500 amp are available for all transformers.

Sizes obtainable are rated from 1 to 100 kva, up to 600 volts, single phase, 3 phase, or 3 to 2 phase.

B-13—Special Milling Machine

Need for fast and accurate milling of locating spots on automotive cylinder heads prompted the design and construction of this automatic special machine by Snyder Tool & Engineering Co. of Detroit. Work-pieces are milled two at a time. Two loaded fixtures index automatically under dual spindle milling heads, which feed cutters across the two bosses on each workpiece. Cutters then rotate about a common center and mill the remaining two bosses on each piece. Upon completion of the milling cycle, cutters swivel to start position, and machine table indexes for unloading. Except for loading and unloading and cycle start, operation is completely automatic